

MURPHY (J.B.)

Internal Approximation:

PATHOLOGICAL HISTOLOGY OF REUNION
AND STATISTICAL ANALYSIS.

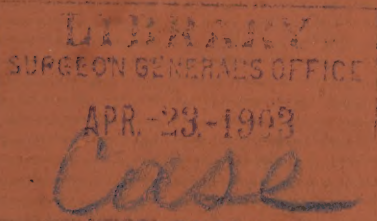
BY

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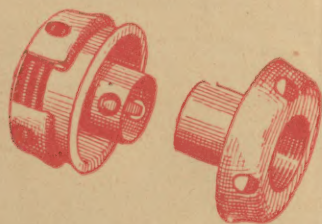
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Case

INTESTINAL APPROXIMATION: PATHOLOGICAL HISTOLOGY OF REUNION, AND STATISTICAL ANALYSIS.¹

By J. B. MURPHY, M.D.,

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MR. PRESIDENT, FELLOWS OF THE ACADEMY: In accepting the invitation of your worthy Chairman, Dr. Bryant, to read a paper before this great scientific body, I appreciated the honor conferred upon me, and realized the fact that in this audience would be gathered many men who had spent the better days of their professional life laboring in this special field, and whose achievements are an ornament to surgery, a heritage to the profession and of incalculable value to humanity.

I am greatly relieved by the knowledge that I will be assisted in the presentation of the various aspects of the subject by the gentlemen who are to participate in the discussion. If some phases of the subject of intestinal approximation appear to be treated cursorily, it is because the gentlemen who follow have had a greater experience in certain procedures and are therefore better able to present the subject from a practical stand-point. I realize that I have no novel propositions to make, nor have I a new device or method to present for your consideration. It is my desire to discuss the pathological histology of reunion, and to give an impartial retrospection of the clinical achievements by the different methods under the same favorable circumstances. Therefore I will not enter into antiquities, nor even into the mediæval history of intestinal anastomosis, but will confine myself to the records of the last six years. The reason for this is apparent, as no method of approximation, however perfect in the pre antiseptic period, could give the favorable results which are attainable at the present day. With a slight reservation, the same may be said of the methods in the antiseptic epoch. In the first period I include all before the advent of Listerism, in the second, the methods employed from 1872 to 1888. In this period the knowledge of physiology and histology upon which the technique of intestinal surgery was based, as well as the technique itself, were imperfect, which was very detrimental to the success of operative procedures. In the third epoch, from 1888 to the present time, all methods have had equal opportunities to produce the same results, as the principles governing intestinal anastomosis have been well established.

In order to attain good results in intestinal approximation we must consider the means of: 1. Securing accurate contact of surfaces. 2. Producing speedy and permanent adhesion of the approximated portions. 3. Maintaining an opening sufficiently large for immediate purposes. 4. Producing a cicatrix that will not contract to a deleterious degree. 5. Accomplishing all of these in the most simple and rapid manner.

The means that have been employed to attain these ends are well classified as follows: 1. Suture. 2. Suture with mechanical aid. 3. Mechanical means.

Before considering the special application of the various methods, let us devote a few minutes to the anatomy of the organs to be approximated. For purposes of approximation, the points which concern the surgeon most are: 1. The strength of the wall of the viscus. 2. Its histological power of agglutination and regeneration.

I have determined experimentally the strength of the walls of the various hollow viscera of the digestive tract against diastaltic pressure, with the following results: The

wall of the stomach in large living adult dogs withstood an average pressure of 8 pounds before the peritoneum ruptured; it required 9 pounds to rupture the entire wall of stomach. The peritoneal coat of duodenum gave way opposite mesentery under a pressure of 10 pounds. The lower portion of ileum withstood a pressure of 9 pounds, when it ruptured on the convex side; the peritoneal and muscular coats gave way under $6\frac{1}{2}$ pounds. The ileum, two yards above the ileo cæcal valve, ruptured under 7 pounds. In the middle portion of the jejunum the peritoneal coat ruptured at 7 pounds, and the entire wall at 11 pounds on the convex side. The lower four inches of ileum, cæcum, and four inches of colon, ruptured at $7\frac{1}{2}$ pounds for the peritoneal coat, and at $8\frac{1}{2}$ pounds for complete rupture. The rupture invariably occurred on the convex side of the ileum, one-half to three-fourths inch from the attachment to the colon. The colon ruptured at 15 pounds, the muscular, serous and mucous coats giving way before the tunica propria.

With tube inserted in the papilla of the ductus communis choledochus, the pancreatic duct withstood 11 pounds pressure before rupture. The gall-bladder and cystic duct resisted a pressure of 13 pounds before the gall bladder ruptured.

In only one of the experiments on the alimentary canal, including the gall-bladder, did air escape into the mesentery, showing that the walls of these hollow viscera in the dog possess a greater resistance at the seat of the mesenteric attachment, where there is no peritoneum, than in the portion covered by peritoneum. It was noted that under 3 to $4\frac{1}{2}$ pounds pressure, small bubbles of air could be seen passing through the mesenteric veins. The order of rupture of the coats was: 1, peritoneal and muscular coats, in an irregular line, in the long axis of the bowel; 2, mucous coat, which was torn in shreds, transversely to the axis of the bowel; and finally the tunica propria, which always ruptured parallel to the long axis of the bowel. When the mucous and submucous coats were divided before the distention, the other coats ruptured under $1\frac{1}{2}$ pound pressure.

The following were the average results obtained on cadavers four days after death: Peritoneal and muscular coats of stomach lacerated extensively under $3\frac{1}{2}$ pounds pressure, and ruptured always on the anterior surface of the lesser curvature close to the mesenteric attachment under $4\frac{3}{4}$ pounds pressure. Jejunum ruptured under a pressure of $4\frac{1}{2}$ pounds, always on the mesenteric side, the peritoneal and muscular coats on the convex side giving way before complete rupture. The colon to within four inches of the ileo-cæcal valve ruptured under $4\frac{1}{2}$ pounds pressure. The lower four inches of ileum, cæcum, and eight inches of ascending colon included in the same ligatures, ruptured under a pressure of $7\frac{1}{2}$ pounds, the rupture occurring on the mesenteric side of the colon. The peritoneal coat of the sigmoid flexure ruptured under a pressure of $2\frac{3}{4}$ pounds, and the tunica propria under a pressure of $4\frac{3}{4}$ pounds. With the tube inserted in the papilla of the ductus communis choledochus, rupture of the pancreatic duct occurred under a pressure of $5\frac{3}{4}$ pounds; with the tube inserted in the cystic duct, the gall-bladder ruptured on the peritoneal side under a pressure of 12 to 22 pounds.

These experiments show that the resistance of the wall

¹ Read by invitation before the New York Academy of Medicine, December 7, 1893.

of the gastro-intestinal tract against diastaltic pressure is sustained; (1) by the mucous, muscular and serous coverings, and (2) after a rupture of these by the submucous coat (*tunica propria*). The mucous membrane offered but very little support to the wall of the bowel, as it tore into transverse shreds over the entire circumference during the process of distention.

To maintain the strength of the bowel it is necessary to have the submucous and serous coats of the wall united at the seat of approximation. The *tunica propria* is used as a mechanical support, but its regenerative power is slow and very limited, while the peritoneal coat has great and rapid power of adhesion and proliferation. Therefore the serous coat is the one upon which the surgeon must depend most for primary agglutination and adhesion, on account of these two properties of the peritoneum, and it must always receive the greatest attention in all methods for producing intestinal anastomosis. It has been repeatedly observed that moderately firm adhesions between two approximated, abraded or injured peritoneal surfaces, form in six hours when the surfaces are aseptic. After isolation of the layers, the mucous membrane, muscular layer and serous coat tear in all directions with equal and moderate force; the submucosa cannot be torn transversely, but with great force it ruptures. It can be torn longitudinally with considerably less pressure. As we must depend upon the submucosa for retention of the coaptation, the *Lembert suture* should therefore be inserted, when we desire to give the union its greatest strength, transversely to the longitudinal axis of the bowel, and should embrace the submucosa, as by Cushing's right-angle suture. If the surfaces are septic, union will not take place, but should they temporarily adhere, the exudate will rapidly disintegrate and the surfaces separate. Asepsis is therefore a factor of great moment in securing permanent union after intestinal approximation. No matter what means are employed to produce the approximation, the surfaces will not unite if they are septic, for the same reason that we have an absence of primary union in septic incised wounds in other parts of the body.

In reporting autopsies following non-union in intestinal approximations, it is important to state whether a septic peritonitis existed at the time of operation.

Histology.—From the articles on the pathological histology of the union of the bowel with the Czerny-Lembert suture, by Ritschl and Walter Rindfleisch, we take the following: It is important to know from many standpoints how the reunion of a divided intestine takes place, how rapid the adhesion, how soon definitive union occurs, and what disposition is made of the suture material. Up to the present time the greatest attention has been paid to the pathology of perforations, the causes of death following, and the new methods of approximation, and little attention has been given to the pathology of the reparative process itself.

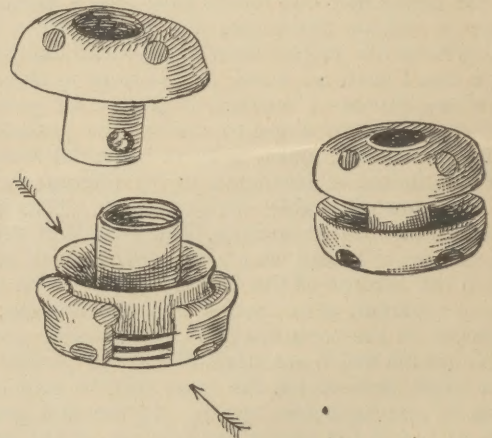
An examination of an end-to-end approximation of the intestine (Czerny-Lembert suture), forty-eight hours after the operation, shows the mucous membrane very much contracted and an exposed free submucosa. The submucosa is covered with lymph and pus corpuscles; the seat of approximation is recognized by a striated, infiltrated tissue. The muscular coat has undergone no perceptible change. The serosa and omentum are notably thickened and congested. The stitch holes can be observed, the surrounding tissue is densely infiltrated, and an intensely dark ring around the stitch canal. Coils of intestine are adherent to each other at site of suture, and bent at short curves.

Fourth Day.—Firm adhesion; suture does not appear on surface; around many of the sutures stitch abscesses have formed. Knuckles of intestine firmly adherent to wall at seat of suture, bent at sharp curves, but still admit the passage of water.

Microscopically the union of the ends is not produced by a juxtaposition of separated coats of the incised surfaces, but the connection is made by a zone of inflam-

matory infiltration with a substratum of the remains of the serosa and muscularis. The mucous membrane has healed over the formerly exposed submucosa, its base protrudes and rests upon the cicatricial tissue, so that many of its glands are deposited thereon. In the mucous membrane, especially in the *tunica propria*, there exists, for three or four centimetres, a catarrhal condition not infrequently accompanied by wandering leucocytes above and below the union. The submucosa is almost approximated from either side, and but very little changed from its normal condition. A very slight cell-proliferation and enlargement of the vessels exists, so small that it can scarcely be distinguished from its normal condition. The muscular coat shows a marked cell-proliferation and vascularization, and takes part in the formation of the scar. The border of the serosa is obliterated in its union with the omentum, and is thickened at the seat of the suture from five to ten times its normal size. One stitch abscess is formed where the stitch drew in a portion of the mucous membrane.

Eighth day.—At the seat of suture coils of intestine are adherent to the sutured surface and also to each other, forming a bunch. The descending portions of the intestine are grouped around the site of the suture in short curves. The adhesions are broad and firm; they cannot be torn, but must be cut with scissors. Notwithstanding the short curves, there is no angle produced sufficient to obstruct, the lumen being free throughout.



The approximation projects above the level of the surface of the mucous membrane, and there is an ectropion of the mucosa from the scar.

Microscopical Examination.—At the muscularis the tissue is retracted; there is a disarrangement of the direction of the fibres, with a small multiplication and infiltration of cells recognizable. The serous surfaces are united to each other and to the omentum without much change of their structure, although there is thickening of the zone by inflammatory exudate.

Twenty-first Day.—Omentum adherent over one-third of line of suture; the bowel contracted at the seat of suture to the size of a dime, while above and below the intestinal lumina were of equal size, or about the size of a nickel. On the mucous side is found a small furrow with sharp edges, showing the seat of cicatrization. There is a small light-gray scar on the furrow.

Microscopical Examination.—The mucous membrane is united without interruption. The muscularis mucosa is separated by a distance of from 1 to 2 mm. The greatest irregularity prevails in the union of the muscularis, the muscular fibres being distributed in all directions. The serosa is somewhat thickened. The silk can be seen unchanged, and surrounding it is a cell infiltration. The *tunica propria* does not differ in the least from its normal condition. There is a spindle-shaped termination of the muscular coat in the scar. The new formation of muscle cells is inconsiderable.

Eighty-sixth Day.—Omentum adherent at site of suture. Intestines adherent in very short curves, but no angle produced. No obstruction. There exists a circu-

lar contraction; the lumen at the seat of suture is about the size of a nickel. This circular contraction is formed by an elevation 2 to 3 mm. in thickness above the surface of the mucous membrane, which is always produced by a Czerny-Lembert suture.

Microscopical Examination.—There is an elevation upon the mucous surface, in the centre of which is a depression where the mucous membrane rests upon the submucosa. The submucosa is unchanged except on its extreme outer limits, where its fasciculi extend into those of the cicatricial tissue. The muscular wall is not perceptibly changed. The serosa in the scar has lost its identity entirely, while on the surface it is united to the omentum, passes continuously over the scar, and has not changed its structure. The suture material is unchanged. It is surrounded by an area of infiltrated tissue of numerous large cells with large nuclei.

One Hundred and Sixth Day.—Omentum adherent. The calibre at the line of suture, compared with the intestine above and below, is relatively as a dime is to a nickel.

Microscopical Examination.—The mucous membrane shows no evidence of a previous separation. The muscular layers are connected by fibrous bands through the scar-tissue. The muscular tissue up to the line of approximation is absolutely unchanged. The serosa gradually thickens as it approximates the scar, is very vascular, and its tissue becomes more dense, which is caused in particular by an increase in the number of spindle-celled elements. Silk unchanged.

One Hundred and Thirtieth Day.—The intestine above and below the scar is of equal calibre.

Microscopical Examination.—The mucous membrane united perfectly, showing no evidence of line of union. The circular muscular fibres held together by a thin band of connective tissue. The longitudinal muscular fibres are much more firmly united, the fibres from one side to the other being continuous.

Conclusions.—From the above description of the pathological conditions, the following deductions may be drawn: The ectropion of the mucous membrane after an incision is passive, and is due to the elastic retraction of the underlying submucosa and muscularis. For this reason, by the Czerny-Lembert suture there is an almost uniform coaptation of the edges of the mucous membrane without the aid of a special suture, which protects by its intimate approximation the underlying tissue from exposure and infection. This would not occur with a Lembert suture alone, as there would be an overlapping or separation without the Czerny. When there is a defect in coaptation of the mucous layer, union must take place by secondary intention, and the tissue is exposed to all of the dangers of infection, viz., non-union, fistula, circumscribed abscess, the same as in secondary union upon the cutaneous surface. Glandular tissue is not regenerated over this area.

The submucosa plays an important rôle in intestinal approximation from the moment of coaptation. While it takes but very little part in the regenerative process, we depend principally upon it for support given the suture in retaining the bowel in position. The more transversely the stitch is inserted, the greater its support. Later, a short distance back of the line of suture, there is a pronounced vascularization of the submucosa.

Muscularis.—When an exudate intervenes between the opposing muscular layers, the muscle fibres terminate in spindle shaped processes. When the apposition is perfect, the fibres from the opposing sides unite so accurately that the line of union cannot be discerned.

Serosa.—The serosa plays the most important rôle in the inflammatory or regenerative reaction. By it we have produced the first adhesive exudate, which process commences immediately after approximation, and in a few hours cements the recently united surface, as supported by Jobert's principles. The vascularization and thickening of the serous coat commences and reaches

about $\frac{1}{3}$ ctm. in thickness, 3 to 4 ctm. away from the line of union, and becomes more dense as it approaches the line of suture. The omentum that becomes adherent is also greatly thickened by cell-infiltration and increased vascularization, and on the eighth day the adhesions are so firm that they cannot be separated without lacerating the subjacent tissues. Frequently the neighboring coils of intestine become adherent at the line of union; the danger of this is that the loop may be so short as to produce an acute angle in the coil, and thereby cause obstruction. The resistance of the bowel against diastaltic pressure is offered almost entirely by the submucosa and muscularis; they resume their normal function after a perfect union. From this it will be seen that, in order to procure a perfect result in intestinal approximation a primary union, not necessarily of all the coats but of some, is imperative. It is not necessary that they should adhere to each other, but that the various coats should approximate as closely as possible. In the great majority of cases following suture of the bowel, there are adhesions of coils of the intestines, mesentery and omentum; as a rule, they do no harm and, I believe, aid in retaining the bowel in the proper direction at the site of union, as well as supporting and protecting the line of suture. *There occurs of necessity with the Czerny-Lembert suture a degree of stenosis*; this is produced by a protrusion of the Czerny portion of the approximation into the lumen of the bowel through the approximation of the serosa with a Lembert suture. F. Byron Robinson found this produced a complete occlusion of the bowel in three weeks, in the dog.

The following is a report of the pathological changes after operation with button, of specimen four days after operation, furnished me by Dr. E. H. Lee. Button had been voided twelve hours previous, the shortest time in which a button had liberated itself. Omentum firmly adherent one-half inch above and below the line of union. Thickness of wall of bowel the same at the cicatrix as on either side. Microscopical appearance of transverse section of cicatrix:

1. Serosa, thickened about seven times its normal size by infiltration within, and exudation upon its surface. The line of adhesion between it and omentum cannot be discerned.
2. The longitudinal muscular coat is not united at seat of approximation, though the ends stand in direct apposition to each other.
3. The circular muscular coat is in the same relation and shows granulations.
4. The mucosa is entirely separated over cicatrix; the edges atrophied and overlap underlying layer.
5. Regeneration of the tissues across the line of union has not yet commenced, except in peritoneum.

Professor Ludwig Hektoen gave the following report: *Longitudinal Section through Line of Union in the Small Intestine of a Dog Thirty Days after End to end Approximation with Button.* 1. *The Serosa.*—This layer appears but very slightly thickened; it is closely applied to the longitudinal muscular coat over the precise line of union, but beyond this there is some subserous areolar tissue in which are a few small blood-vessels, as well as lymphatics.

2. *The Longitudinal Muscular Coat.*—Quite large parts of this coat are continuous across the union line; but there are masses and bands of cicatricial tissue distributed between these different continuous muscle layers. On each side of the line of union the muscular tissue of this coat appears absolutely normal.

3. *The Circular Muscular Coat.*—This part of the wall is completely interrupted along the line of union by interlacing narrow bands of fibrous tissue that enclose small masses of transversely cut muscle fibres and extend to the mucous coat. Immediately to one side of this point the circular coat is replaced by a district of loose areolar tissue, containing large blood-vessels with very thick walls and irregular quantities of transversely divided muscle fibre; beyond this district the muscular layer appears normal. To the other side of the union line appears a mass of transversely divided muscle, trav-

ersed by bands of fibrous tissue; and then comes an area of loosely meshed tissue, containing very thick blood-vessels, and next the normal muscular layer.

4. *The Submucous Coat.*—As already stated, interlacing bands of fibrous tissue extend through this layer from the muscular coat. On each side of the line of union the submucous coat appears normal, except that on one side the tissue seems rather dense. There are no lymphatic structures in this part of the intestine.

5. *The Mucous Membrane.*—The muscularis mucosæ is completely interrupted, the glands resting upon the cicatricial tissue traced upward from the serosa on a line even with the ends of the muscularis mucosæ, which appears otherwise normal. The villi are largely absent, not only over the line of union, but elsewhere, and this is most likely due to the rough and extensive handling the specimen has met with since its removal. The mucosa is continuous across the line of union, but much thinner here than elsewhere, and made up of somewhat irregularly arranged glandular tubules lined with short columnar cells; some of these tubules are cut transversely, others longitudinally or obliquely; between the tubules is some small-celled infiltration, and projecting from the free surface are irregularly shaped, large and small, villous projections without the usual columnar-celled lining. On each side of the line of union the mucosa appears quite normal, with perhaps a few more small round cells between the tubules than usual.

Recapitulation.—The line of union, which is almost linear in thickness, can be traced by the cicatricial tissue, which, though very small in amount, is distinct. The various layers appear to be in perfect juxtaposition. The longitudinal muscular coat can be said to be almost restored; the transverse muscular, submucous, and the muscularis mucosæ, are almost completely united by connective tissue at the line of union, while the mucosa proper has undergone partial regeneration.

Longitudinal Section through Line of Union in Small Intestine Sixty Days after End-to-end Approximation by Same Means.—In this specimen the restoration of the various layers in the intestinal wall is much farther advanced than in the thirty-days specimen; in some respects the restorative changes are complete. The various layers have been held in complete juxtaposition, and are continuous. There is no thickening of the serous coat, except just across the line of union. The longitudinal and circular muscular layers are continuous and not distinguishable from those in the normal intestine, except for this, that they contain some small spaces (blood-vessels) and occasional traces of fibrous tissue. The greatest change is seen in the submucosa, which has been converted into a thick cicatricial tissue containing vessels with very thick walls. Corresponding to this point of submucous cicatricial thickening, the muscularis mucosæ shows considerable increase in thickness also, due largely to fibrous tissue between the muscle layers, which are now continuous. The mucosa proper over this district does not in any way differ from the mucosa elsewhere, and were it not for the thickening described in the submucosa and the muscularis mucosæ it would be difficult, if not impossible, to recognize the line of union.

I believe the pathologists have furnished the solution of the slight contraction following this method of union, viz.: 1, The juxtaposition of coats, *i.e.*, apposition of homogeneous histological elements, with re-establishment of their continuity; 2, the very small amount of connective tissue intervening between the ends of tissue that regenerate slowly, if at all.

In making a comparison of the results obtained by the various methods employed in producing intestinal approximation, there are certain conditions which cannot be accurately estimated, and which must always cause an element of doubt as to the reliability of the deductions drawn from statistics alone. The first of these conditions is the frequency with which unfavorable cases are omitted from the reports, contrasted with favorable ones;

second, the condition of the patient at the time of operation, as some surgeons will undertake a serious operation when the patient is moribund, while others will operate only under favorable circumstances; third, the anatomico-pathological conditions for which the operation is performed; fourth, the ease with which a means of producing approximation can be applied, increases the frequency of its use, as it is resorted to in desperate cases where more complicated measures would not be attempted, thereby increasing the chances for a greater percentage of unfavorable results; fifth, the dexterity of the operator. A striking example of the latter is shown in the results obtained by Riedel in his operation of cholecystostomy in two sittings. He performed this operation 34 times with 34 consecutive recoveries, while in 25 operations of the same kind performed by all other operators there were 6 deaths, a mortality of nearly twenty-five per cent. Another example, is the rapidity with which Abbe can insert thirty-four inches of continuous suturing in his lateral approximation operation, and the good results obtained—5 recoveries in 6 cases. With these facts in view we will proceed with our analysis of the results, beginning with gastro-enterostomy.

Gastro-enterostomy.—The pathological lesions for which this operation is performed are divided into two classes: 1. Neoplasms involving the pylorus or duodenum, producing obstruction; and, 2, cicatricial contractions occluding the pylorus or duodenum. The most common cause of obstruction is carcinoma of the pylorus. In some cases of this disease the obstruction is the first marked symptom of its presence, while in others it does not appear until the disease is very far advanced and the patient greatly emaciated and cachectic. The disease which produces the obstruction in the first class of cases, without excision, necessarily terminates fatally, and the operation of gastro-enterostomy in these cases is only for temporary relief. The patient should not be operated upon unless there is a reasonable chance of considerably prolonging life. While the patients may withstand the immediate effects of the operation, after four or five days they become weaker and weaker, until they finally succumb to the general depression, to which has been added the depressing effect of the operation. The number of cases of this variety operated upon by various methods and the results are as follows:

GASTRO-ENTEROSTOMY FOR MALIGNANT DISEASE.

| | Cases. | Recoveries. | Deaths. | Mortality per cent. |
|--|--------|-------------|---------|---------------------|
| Method, by suture..... | 28 | 16 | 12 | 42.8 |
| Mechanical means..... | 49 | 36 | 13 | 26.5 |
| Suture with mechanical aid..... | 8 | 1 | 7 | 87.5 |
| Total number operated..... | 85 | 53 | 32 | 37.6 |
| Of these the position was, side to side, in..... | 76 | 47 | 29 | 38.2 |
| End to side..... | 4 | 3 | 1 | 25.0 |
| Unknown..... | 5 | 4 | 1 | 20.0 |
| Of the mechanical means employed, bone plates were used: | 36 | 28 | 8 | 22.2 |
| Swedish turnip plates..... | 2 | 1 | 1 | 50.0 |
| Robinson's segmented rubber plate..... | 2 | 1 | 1 | 50.0 |
| Mayo Robson, bone bobbin..... | 2 | 1 | 1 | 50.0 |
| Murphy button..... | 7 | 6 | 1 | 14.3 |
| Suture with mechanical aid. | | | | |
| Means employed: | | | | |
| Abbe catgut rings..... | 5 | 0 | 5 | 100 |
| Brokaw's segmented rubber rings..... | 2 | 1 | 1 | 50.0 |
| Elastic ligatures..... | 1 | 0 | 1 | 100 |

CAUSES OF DEATH BY GASTRO-ENTEROSTOMY.

| Operation with Suture. | | | |
|------------------------|----|-------------------|---|
| Shock..... | 4 | Hemorrhage..... | 2 |
| Exhaustion..... | 13 | Complication..... | 2 |
| Peritonitis..... | 4 | Unknown..... | 4 |
| Ileus..... | 1 | | |

It has been observed that with all other methods except the button, cicatricial contraction occurred in a

GASTRO-ENTEROSTOMY.—I.

| No. | Date. | Publication. | Operator. | Diagnosis. | Operation. | Method. | Position. | RESULT. | | Remarks. |
|-----|---------------|--|---------------------|--|--------------------|---------------------------|-----------|---------|--|--|
| | | | | | | | | Recov. | Death | |
| | | | | | | | | | Cause. | |
| 1 | Feb. 14, '88 | N.Y. Med. Jour., June 30, 1888. | Lange. | Carcinoma pylorus. | Gastro-enterostomy | Suture. | Lat. | 1 | After 31 ds., perforation at site of ulcer. | |
| 2 | Mar. 13, '88 | Med. Chir. Trans., '89 | Lauenstein. | " " | " " | " " | " " | 1 | After 11 ds., exhaustion. | |
| 3 | Dec. 21, '88 | " " " '89 | Rydygier Ja-worski. | " " and stomach. | " " | " Wölfler & Barker. | " " | 1 | After 6 hrs., ileus | Delirium. Wound torn open. |
| 4 | Dec. 31, '88 | N.Y. Med. Jour., June 22, 1889. | Meyer. | Carcinoma stomach. | " " | Suture continuous catgut. | " " | 1 | After 6 hrs., ileus | |
| 5 | '88 | Med. Chir. Trans., '89. | Fritzsche. | Carcinoma pylorus stenosis. | " " | Suture. | " " | 1 | | |
| 6 | '88 | " " " '89. | " | Cicatrical stenosis pylorus. | " " | " " | " " | 1 | | |
| 7 | June 25, '89 | Arch.f.klin.Chir.xxxix. | v. Eiselsberg. | Tumor pylorus, adherent liver & pancreas. | " " | " " | " " | 1 | | |
| 8 | July 7, '89 | " " " " " | Salzer. | Tumor involving transverse colon. | " " | " " | " " | 1 | | |
| 9 | July 13, '89 | " " " " " | " | Tumor pylorus, without stenosis. | " " | " " | " " | 1 | After 7 hrs., ligation hepatic artery. | |
| 10 | Aug. 22, '89 | " " " " " | " | Tumor pylorus. | " " | " " | " " | 1 | | |
| 11 | Sept. 10, '89 | " " " " " | v. Eiselsberg. | " " | " " | " " | " " | 1 | After 3 days, perforation of ulcer at point of suture. | |
| 12 | '89 | Deut. med. Woch., May 23, 1889. | Lauenstein. | Cicatrical stenosis pylorus, ulcer. | " " | " Wölfler. | " " | 1 | | |
| 13 | '89 | Brit. Med. Jour., April 22, 1893. | Moullin. | Growth in duodenum. | " " | " " | " " | 1 | | |
| 14 | Mar. 22, '90 | Wien. klin. Woch., Nov. 3, 1892. | v. Hacker. | Stenosis pylorus. | " " | " implantation. | E. S. | 1 | | |
| 15 | Aug. 18, '90 | Hygeia, Sept., 1891. | Borelius. | Cancer pylorus. | " " | Suture Wölfler | Lat. | 1 | After 5 hrs. | |
| 16 | Oct. 24, '90 | Lancet, Jan. 3, 1891. | Barrow. | Gastric ulcer. | " " | " " | " " | 1 | After 2 ds., ileus. | |
| 17 | May 23, '91 | Wien. med. Presse, Nov. 20, 1892. | Schramm. | Tumor pylorus. | " " | " " | " " | 1 | | |
| 18 | June 17, '91 | Wien. klin. Woch., Nov. 26, 1892. | Brenner. | Cancer pylorus. | " " | " Brenner | " " | 1 | | Death 4 mos. later. |
| 19 | July 15, '91 | Wien. med. Presse, Nov. 20, 1892. | Schramm. | Adeno-carcinoma pylorus. | " " | " " | " " | 1 | | |
| 20 | Dec. 7, '91 | Med. Rec., April 2, '92. | Abbe. | Carcinoma pylorus and stomach. | " " | " " | " " | 1 | Few hrs., exhaustion. | |
| 21 | Dec. 8, '91 | Wien. med. Woch., Nov. 19, 1892. | Maydl. | Carcinoma pylorus. | " " | " Maydl. | E. S. | 1 | | |
| 22 | '91 | Berl. klin. Woch., Jan. 25, 1892. | Hadra. | " " | " " | " v.Hacker. | Lat. | 1 | | |
| 23 | '91 | Wien. med. Presse, Nov. 20, 1892. | Schramm. | Tumor pylorus. | " " | Suture Wölfler-Lembert. | " " | 1 | | Death 4 mos. later. Marasmus. |
| 24 | '91 | Deut. med. Woch., Dec. 8, 1892. | Mikulicz. | Carcinoma pylorus. | " " | Suture Czerny-Lembert. | " " | 1 | | |
| 25 | Jan. 15, '92 | Wien. klin. Woch., Nov. 26, 1892. | Brenner. | " " | " " | " Brenner | " " | 1 | | Death 2 mos. later. |
| 26 | Jan. 16, '92 | Wien. klin. Woch., Nov. 26, 1892. | " | " " | " " | " " | " " | 1 | 20 hrs., shock. | |
| 27 | Jan. 25, '92 | Hygeia, Jan., 1893. | Sandberg. | Cicatrical stenosis pylorus. | " " | " Wölfler. | " " | 1 | | |
| 28 | Jan. 31, '92 | Wien. klin. Woch., Nov. 24, 1892. | v. Hacker. | Carcinoma pylorus. | " " | " implantation. | E. S. | 1 | 6 days, catarrhal pneumonia, gangrene. | |
| 29 | Feb. 10, '92 | Lo Sperimentale, 1892. | Colzi. | Cicatrical stenosis pylorus-ulcer. | " " | Suture. | Lat. | 1 | | |
| 30 | Mar. 1, '92 | Wien. klin. Woch., Nov. 24, 1892. | v. Hacker. | Carcinoma pylorus. | " " | " Wölfler. | " " | 1 | | Temporary improvement. |
| 31 | Mar. 21, '92 | Lo Sperimentale, 1892. | Colzi. | Stenosis pylorus. | " " | " " | " " | 1 | | |
| 32 | Mar. 31, '92 | Wien. klin. Woch., Nov. 10, 1892. | v. Hacker. | Lympho sarcoma, stomach. | " " | " " | " " | 1 | | |
| 33 | April 28, '92 | Gaz. d. Hôp., June 30, 1892. | Michaux. | Cancer stomach. | " " | " v.Hacker. | " " | 1 | | |
| 34 | April 29, '92 | Lo Sperimentale, 1892. | Colzi. | Cicatrical stenosis pylorus. Sulphuric acid. | " " | Suture. | " " | 1 | | |
| 35 | May 8, '92 | Wien. med. Woch., Nov. 1, 1893. | Albert. | Stenosis pylorus. Atrophy muscularis of stomach. | " " | " Lem-bert. | " " | 1 | | |
| 36 | May 17, '92 | Wien. klin. Woch., Nov. 24, 1892. | v. Hacker. | " " | " " | " " | " " | 1 | | |
| 37 | May 27, '92 | Lo Sperimentale, 1892. | Colzi. | Carcinoma pylorus. | " " | Suture. | " " | 1 | 4 ds., exhaustion | |
| 38 | May 31, '92 | Unpublished. | Beck. | " " | " " | " Maydl. | " " | 1 | 4 days, hæmorrhage pancreas | |
| 39 | June 30, '92 | Chic. Med. Rec., Oct., 1892. | " | Cicatrical stenosis pylorus. | " " | " " | " " | 1 | | Death 2 wks. later. Embolism pulmonary artery. |
| 40 | July 5, '92 | Mercredi, Méd., No. 44, 1892. | Terrier. | Tumor pylorus. | " " | " " | " " | 1 | | |
| 41 | July 12, '92 | Bull. et Mém. d. l. soc. de Chir., Nov., 1892. | Delaganière. | Cancer pylorus diffuse. | " " | " " | " " | 1 | 5 ds., cachexia. | |
| 42 | July 23, '92 | Bull. et Mém. d. l. soc. de Chir., Nov., 1892. | Reclus. | Stenosis pylorus dilatation. | " " | " " | " " | 1 | | |
| 43 | Aug. 26, '92 | Johns Hopkins Hosp. Bull., May, 1893. | Finney. | Cicatrizing ulcer pylorus. | " " | " 2 Halsted | " " | 1 | 15 ds., diarrhoea | |
| 44 | '92 | Med. Review, July 8, 1893. | Keen. | " " | " " | " " | " " | 1 | | |
| 45 | '92 | Verh. d. Deut. Ges. f. Chir., 1892. | v. Bramann. | " " | " " | " Wölfler. | " " | 1 | | |
| 46 | '92 | Verh. d. Deut. Ges. f. Chir., 1892. | " | " " | " " | " Courvoisier. | " " | 1 | | |
| 47 | '92 | Verh. d. Deut. Ges. f. Chir., 1892. | " | " " | " " | Suture Courvoisier. | " " | 1 | | |
| 48 | '92 | Bull. et Mém. d. l. soc. de Chir., Nov., 1892. | Schwartz. | Carcinoma pylorus stenosis. | " " | Suture Wölfler | " " | 1 | 4 days. | |
| 49 | Feb. 24, '93 | Gaz. d. Hôp., Aug. 1, 1893. | Le Bec. | Carcinoma pylorus. | " " | " Terrier. | " " | 1 | | |
| 50 | Mar. 14, '93 | Gaz. d. Hôp., Aug. 1, 1893. | " | Carcinoma stomach. | " " | " " | " " | 1 | | |
| 51 | | Brit. Med. Jour., April 22, 1893. | Barker. | Carcinoma pylorus. | " " | " " | " " | 1 | | |
| 52 | | Brit. Med. Jour., April 22, 1893. | " | " " | " " | " " | " " | 1 | | |
| 53 | | Brit. Med. Jour., April 22, 1893. | " | " " | " " | " " | " " | 1 | Soon after operation. | |

1 v. Hacker.

2 Loreta, op.

GASTRO-ENTEROSTOMY.—II.

| No. | Date. | Publication. | Operator. | Diagnosis. | Operation. | Method. | Position. | RESULT. | | Remarks. |
|-----|---------------|---|-------------|---------------------------------------|--------------------|----------------------------|-----------|---------|--------------------------------|--|
| | | | | | | | | Recov. | Cause. | |
| 1 | Dec. 16, '88 | Med. Rec., Nov. 14, 1891. | Senn. | Carcinoma pylorus & head of pancreas. | Gastro-enterostomy | Bone-plates. | Lat. | 1 | 6 ds. perforative peritonitis. | |
| 2 | '88 | Med. Chir. Trans., '89. | Ransohoff. | Carcinoma pylorus. | " | " | " | 1 | " | |
| 3 | '88 | Med. Rec., Nov. 14, 1891. | Senn. | " | " | " | " | 1 | 5 ds. marasmus. | |
| 4 | '88 | Med. Rec., Nov. 14, 1891. | " | " | " | " | " | 1 | " | Death 14 weeks later. Marasmus. |
| 5 | '88 | Med. Rec., Nov. 14, 1891. | " | " | " | " | " | 1 | " | Death 3 weeks later. Marasmus. |
| 6 | '88 | Med. Rec., Nov. 14, 1891. | " | " | " | " | " | 1 | " | Death 4 months later. Marasmus. |
| 7 | Mar. 31, '89 | Med. Rec., Nov. 14, 1891. | " | Carcinoma pylorus & head of pancreas. | " | " | " | 1 | 2 hrs. shock. | |
| 8 | April 10, '89 | Med. Rec., Nov. 14, 1891. | " | Carcinoma pylorus. | " | " | " | 1 | " | Death 2 wks. later. Hemorrhage (carcinoma). |
| 9 | Aug. 22, '89 | Med. News, Feb. 1, 1890. | Stamm. | " | " | " | " | 1 | " | Death 43 days later. Marasmus. |
| 10 | Sept. 20, '89 | Brit. Med. Jour., Nov. 16, 1889. | Clarke. | " | " | " | " | 1 | " | |
| 11 | Dec. 16, '89 | Brit. Med. Jour., Feb. 8, 1890. | Stansfield. | Stenosis pylorus, malignant. (?) | " | " | " | 1 | " | Death 4 mo. later. Marasmus opening entirely closed. |
| 12 | Jan. 31, '90 | Med. Rec., Nov. 14, 1891. | Senn. | Carcinoma pylorus. | " | " | " | 1 | " | Death 20 months later. Marasmus. |
| 13 | Feb. 23, '90 | Lancet, July 12, 1890. | Jessett. | " | " | " | " | 1 | 5 days' exhaustion. | Autopsy. Opening patent. |
| 14 | Mar. 22, '90 | Med. Rec., Nov. 14, 1891. | Senn. | " | " | " | " | 1 | " | Death 11 days later. Croupous pneumonia. |
| 15 | April 30, '90 | Lancet, May 23, 1891. | Robson. | " | " | " | " | 1 | " | Death 95 days later. Exhaustion. No autopsy. |
| 16 | " " '90 | " " 2, 1891. | Jessett. | " | " | " | " | 1 | " | |
| 17 | May 13, '90 | " Dec. 6, 1890. | Clarke. | "Gastric troubles." Hæmatemesis. | " | " | " | 1 | " | Death 30 days later. No autopsy. |
| 18 | " 18, '90 | Brit. Med. Jour., April 11, 1891. | " | Tumor pylorus. | " | " | " | 1 | " | Death 3 wks. later. Opening entirely closed. |
| 19 | " 31, '90 | Lancet, Oct. 11, 1890. | Beatson. | Carcinoma pylorus. | " | " | " | 1 | 3 days' asthenia. | Opening admitting forefinger. |
| 20 | " '90 | Brit. Med. Jour., May 17, 1890. | Robson. | " " (?) | " | " | " | 1 | " | |
| 21 | June 4, '90 | Lancet, Oct. 11, 1890. | Beatson. | " | " | " | " | 1 | " | Death 4 weeks later. Pneumonia. Opening admitting forefinger. |
| 22 | '90 | Med. Rec., Nov. 14, 1891. | Senn. | " | " | " | " | 1 | 5 hours' shock. | |
| 23 | '90 | Brit. Med. Jour., Feb. 8, 1891. | Rawdon. | " | " | " | " | 1 | " | |
| 24 | '90 | Lancet, July 12, 1891. | Jessett. | " | " | " | " | 1 | " | |
| 25 | Jan. 22, '91 | Med. Rec., Nov. 14, 1891. | Senn. | Stenosis pylorus, dilatation. | " | " | " | 1 | " | Death 18 days later. Exhaustion. |
| 26 | Feb. 27, '91 | Lancet, May 2, 1891. | Bennett. | Stenosis pylorus, probably malignant. | " | " | " | 1 | " | |
| 27 | Mar. 30, '91 | Med. Rec., Nov. 14, 1891. | Senn. | Carcinoma pylorus. | " | " | " | 1 | " | Death 3 months later. Marasmus. |
| 28 | Mar. 30, '91 | Northw. Lancet, May 15, 1893. | Ramsay. | " | " | " | " | 1 | " | |
| 29 | April 25, '91 | Northw. Lancet, May 15, 1893. | " | Stenosis pylorus, non-malignant. | " | " | " | 1 | " | |
| 30 | May 22, '91 | Lancet, June 11, 1892. | Larkin. | Malignant disease of stomach. | " | " | " | 1 | " | Cicatricial closure of opening requiring subsequent jejunostomy. |
| 31 | July 1, '91 | Austral. Med. Gaz., July, 1892. | Hankins. | Cancer pylorus. | " | " | " | 1 | " | Death 7½ months later. Opening entirely closed. |
| 32 | " 10, '91 | Brit. Med. Jour., Jan. 9, 1892. | Barker. | " stomach. | " | " | " | 1 | " | Death 46 days later. Pneumonia. |
| 33 | " 10, '91 | Med. News, Oct. 1, 1892. | Ruth. | " pylorus. | " | " | " | 1 | 12 hours' exhaustion. | |
| 34 | Aug. 21, '91 | Med. Rec., Nov. 14, 1891. | Senn. | " | " | " | " | 1 | 8 hours' shock. | |
| 35 | Sept. 8, '91 | Brit. Med. Jour., April 22, 1893. | Hume. | " | " | " | " | 1 | " | Death 9 weeks later. Extension of carcinoma. |
| 36 | Sept. 10, '91 | Med. Chir. Trans., '92. | Robson. | " " stenosis. | " | " | " | 1 | 3 days' exhaustion. | |
| 37 | Oct. 26, '91 | Lancet, Mar. 28, 1892. | Taylor. | Cancer " " | " | " | " | 1 | " | |
| 38 | Nov. 11, '91 | Liverpool Med. Chir. Jour., Jan. 1892. | Paul. | " " and stomach. | " | " | " | 1 | " | |
| 39 | Nov. 16, '91 | Brit. Med. Jour., Jan. 9, 1892. | Renton. | Tumor pylorus malignant. | " | " | " | 1 | " | Tumor disappeared. |
| 40 | Dec., '92 | Canada Practit., Feb., 1893. | McFarlane. | Malignant disease, pylorus. | " | " | " | 1 | " | Death 6 mo. later. Opening entirely closed. |
| 41 | Dec., '91 | Lancet, May 2, 1892. | Brown. | "Dyspepsia trouble," malignant. (?) | " | " | " | 1 | " | Death 4 months later. |
| 42 | Feb. 6, '92 | Glasg. Med. Jour., Dec., 1892. | Renton. | Chronic dyspepsia, dilatation. | " | " | " | 1 | " | |
| 43 | Feb. 25, '92 | Wien. klin. Woch., Nov. 3, 1892. | v. Hacker. | Carcinoma pylorus. | Gastro-enterostomy | Suture & bone-plates. | E. S. | 1 | " | |
| 44 | Mar. 19, '92 | Lancet, June 4, 1892. | Purcell. | Carcinoma pylorus & stomach. | Gastro-enterostomy | Bone-plates. | Lat. | 1 | " | |
| 45 | Dec., '92 | " Aug. 19, 1893. | Moullin. | Chronic gastritis, non-malignant. | " | " | " | 1 | " | Death 6 wks. later. Exhaustion. Pin hole opening. |
| 46 | '93 | Brit. Med. Jour., April 22, 1893. | Allingham. | Carcinoma pylorus. | " | " | " | 1 | " | Death 4 mo. later. Extension of disease. |
| 1 | May 7, '92 | Ctbl. f. Chir., June 11, 1892. | v. Baracz. | " | " | Swedish turnip plates. | " | 1 | " | |
| 2 | Nov. 12, '92 | St. Petersburg. med. Woch., May 15, 1893. | Butz. | Stenosis " | " | Swedish turnip plates. | " | 1 | 46 ds. exhaustion. | |
| 3 | Dec. 4, '92 | St. Petersburg. med. Woch., May 15, 1893. | " | Cancer " | " | Swedish turnip plates. | " | 1 | 72 hours' exhaustion. | |
| 4 | '92 | Lancet, Aug. 19, 1893. | Moullin. | " | " | Mayo Robson's bone bobbin. | " | 1 | 6 ds. exhaustion. | |
| 5 | '92 | Brit. Med. Jour., April 1, 1893. | Robson. | Cancer pylorus, stenosis. | " | Mayo Robson's bone bobbin. | " | 1 | " | |

GASTRO-ENTEROSTOMY.—III.

| No. | Date. | Publication. | Operation. | Diagnosis. | Operation. | Method. | RESULTS. | | | Remarks. |
|-----|---------------|---|---|--------------------------------------|---------------------|-----------------------------------|-----------|---------|---------------------------------------|--|
| | | | | | | | Position. | Rec'd'd | Cause. | |
| | | | | | | | | Death. | | |
| 1 | Aug. 9, '92 | Unpublished. | Murphy. | Cancer pylorus. | Gastro-enterostomy. | Murphy button. | Lat. | 1 | | Time, 7 minutes. |
| 2 | Sept., '92 | " | " | " | " | " | " | 1 | | |
| 3 | Dec. 26, '92 | Pacific Med. Jnl. Apl., Barbat. 1893. | " | " | " | " | " | 1 | | Autopsy. 46 ds. Perfect union. No contraction Perfect union. |
| 4 | May, '93 | Unpublished. | Wiener. | " | " | " | " | 14 | ds. continued hemorrhage from cancer. | |
| 5 | June 7, '93 | " | Logan. | " | " | " | " | 1 | | Time, 16 min. Patient subsequently died of exhaustion. Autopsy. Perfect union. |
| 6 | Oct., '93 | " | Buecking. | " | " | " | " | 1 | | |
| 1 | '93 | " | Goldspohn. | " | " | Robinson—sequented rubber plates. | " | 1 | | |
| 2 | '93 | " | Lloyd. | " | " | Robinson—sequented rubber plates. | " | 1 | Progressive peritonitis. | |
| 1 | Apl., '89 | Med. News, June 1. McBurney. | Carcinoma pylorus, stenosis. | " | " | Abbe—catgut rings. | " | 1 | After 12 hrs. inaction. | |
| 2 | Dec. 3, '89 | Med. News, Dec. 14. Weir. | Constriction pylorus—probably accidental. | " | " | " | " | 1 | | Probable recovery. |
| 3 | Jan., '90 | Med. Rec., Feb. 22, '90 | " | Stenosis pylorus. | " | " | " | 1 | | |
| 4 | Apl. 16, '90 | " Aug. 23, '90 | Polk. | Carcinoma pylorus, stenosis. | " | " | " | 15 | ds. exhaust. | |
| 5 | Aug. 10, '90 | " Jan. 10, '91 | Bull. | Carcinoma stomach. | " | " | " | 17 | ds. faulty suture. | |
| 6 | Oct. 7, '90 | " Jan. 10, '91 | " | Carcinoma. | " | " | " | 15 | hrs. peritonitis. | Sponge left in peritoneal cavity. |
| 7 | Oct. 7, '90 | " Jan. 10, '91 | Weir. | Supposed fibrous structure, pylorus. | " | " | " | 1 | | |
| 8 | Sept. 9, '91 | Cleveland Med. Gaz., Scott. Feb., 1892. | Inflammatory stenosis pylorus. | " | " | " | " | 1 | | |
| 9 | Mch. 5, '92 | Montreal Med. Jnl., Bell. May, 1892. | Carcinoma stomach | " | " | " | " | 20 | ds. peritonitis | |
| 1 | Sept. 18, '89 | Internat. Jnl. Surg., Carson. Nov., 1889. | Carcinoma pylorus. | " | " | Brokaw—sequented rubber rings. | " | 1 | | |
| 2 | Mch. 29, '90 | Med. News, May 10, '90. | Tukolske. | Stenosis pylorus, epithelioma. | " | Brokaw—sequented rubber rings. | " | 26 | hrs. exhaustion. | |
| 1 | Jan. 12, '91 | Jnl. Am. Med. Assoc., McGraw. May 16, 1896. | Carcinoma pylorus. | " | " | Elastic ligature and Lembert sut. | " | 16 | ds. exhaustion. | |

greater degree in gastro enterostomy by lateral approximation than in any other operation. To avoid the stenosis that might possibly occur, I have devised an oblong button for this class of cases, Fig. 1. An opening from

much greater than this. Of these 28 cases, the total number in which autopsies were reported is 8; 3 of the patients on whom the autopsies were made died before the end of four weeks, and the opening was patent. In the remaining 5 the opening was closed; the time between operation and death was as follows: 3 weeks, 6 weeks, 4 months, 6 months, and 7½ months; making eighty-three per cent. of stenosis in autopsies where the patients survived three weeks. This would appear to be a very forcible objection to the use of this method in gastro-enterostomy and should exclude its application.

The cases of stenosis of pylorus from other causes than malignant diseases are of rare occurrence, and are the ones in which it is important to have an approximation made where the element of contraction will not be of moment for an indefinite period of time. Number of this class :

| | Cases. | Recoveries. | Deaths. | Mortality per cent. |
|------------------------------------|--------|-------------|---------|---------------------|
| Suture | 22 | 18 | 4 | 18.2 |
| Mechanical means | 11 | 10 | 1 | 9.09 |
| Total | 37 | 32 | 5 | 13.5 |
| Of these there were bone plates .. | 10 | 10 | 0 | 0 |
| Swedish turnip | 1 | 0 | 1 | 100 |
| Suture aided by mechanical means | 4 | 4 | 0 | 0 |

The last four were all by Abbe's catgut rings. Cause of death: Exhaustion, 1; ligature of hepatic artery, 1; perforation at seat of suture, 1; diarrhoea, 1; obstruction, 1. The operation that should be performed in this class of cases is a complete separation of the end of the duodenum and stomach at the site of constriction. The end of the stomach or duodenum should be closed with a Czerny-Lembert suture, and the distal end of duodenum sutured or buttoned to the side of the stomach, thereby avoiding all of the disagreeable and dangerous conditions

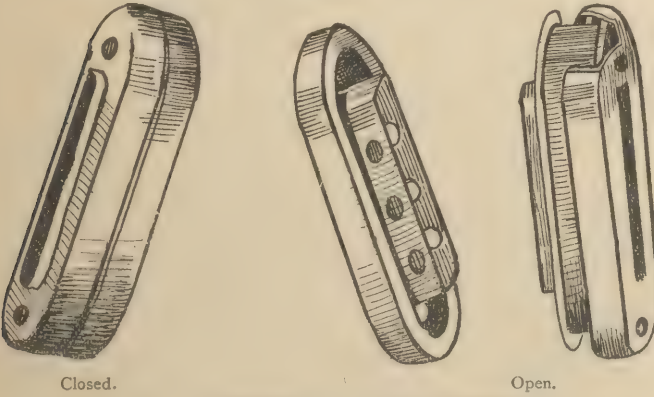


FIG. 1.—Oblong Button for Lateral Approximations.

two to three inches long can be made with this button, and still its greatest diameter is only 5/8 inch, or the same as the diameter of the small button, and can be passed as readily.

Contraction.—In the post mortem records we find reports of complete closure of opening from cicatricial contraction in 5 cases. These were all performed by Senn's method with bone plates, that is, of the 28 cases that survived the immediate effects of the operation, 5 of the number on whom autopsies were subsequently made showed a complete closure of the opening. To this must be added, Mr. Larkin's case, in which stenosis occurred requiring a secondary jejunostomy, making 6 closures in all, and representing 20.7 per cent. of the 28 patients recovering from the immediate effects of operation; as many of them have not had autopsies, it is fair to presume that the percentage of stenosis by this method is very

that accompany gastro-enterostomy by lateral approximation.

PYLORECTOMY WITH GASTRO-ENTEROSTOMY.

| | Cases. | Recoveries. | Deaths. | Mortality per cent. |
|-------------------------------|--------|-------------|---------|---------------------|
| Suture | 24 | 13 | 11 | 45.8 |
| Mechanical means | 2 | 2 | 0 | .0 |
| Suture with mechanical aid .. | 1 | 1 | 0 | .0 |
| Total | 27 | 16 | 11 | 40.7 |

End of duodenum to side of stomach, 4; recovered, 2; deaths, 2. Cause of death, shock, 3; exhaustion, 2; peritonitis, 5; unknown, 1.

To Rydygier belongs the honor of being the first to perform this operation. Billroth advanced the operation to great prominence. The *modus operandi* of the various operators is practically the same up to the stage of suturing the end of stomach. In Billroth's operation the stomach was sutured from the lesser curvature down until only sufficient opening remained to admit of the insertion of the end of the duodenum. The end of the duodenum was then united by a Czerny-Lembert suture to the opening in the end of the stomach. The time occupied for the operation averaged two and a half hours (von Baracz), the greater portion of that time being consumed in uniting the duodenum.

Rawdon's operation was practically the same, except that bone plates were used to approximate the end of the duodenum to end of stomach. The time consumed in

the operation by the Billroth' method was so great that all of the patients were collapsed before it was completed; some of them rallied. There was another danger, it was found that at the junction of the line of suture at the end of stomach with the circle of suture approximating the duodenum, gangrene occurred from the strangulation produced by the suture, and a failure of union resulted, increasing the mortality, already great from shock. To avoid these calamities, it was suggested to close the end of stomach and end of duodenum entirely by suture, and make a lateral approximation of the stomach to the duodenum, or jejunum. This has been performed twenty-four times with 13 recoveries, 11 deaths; 45.8 per cent. It is safer and more rapid than any means used for the approximation of the end of the duodenum to the end of the stomach. A still better method is the approximation of the end of the duodenum to the posterior wall of stomach through an incision made for that purpose. Number of this class operated on by mechanical means (anastomosis button), 2; both recovered. The procedure by this method should be as follows: place a double clamp on stomach and incise the stomach between; also a double clamp on duodenum with incision between. Transfix the mesentery attached to the pyloric portion with a double-threaded needle; ligate as you would a broad pedicle; excise; continuous Czerny suture of end of stomach; remove clamp and insert continuous Lembert suture, entirely closing the end of stomach. Insert female half of button in posterior wall of stomach as usual; with male half in end of duodenum press the

PYLORECTOMY WITH GASTRO-ENTEROSTOMY.

| No. | Date. | Publication. | Operator. | Diagnosis. | Operation. | Method. | RESULT. | | Remarks. |
|-----|---------------|-------------------------------------|-------------|---|-------------------------------------|---------------------|-----------|-----------------------------------|---|
| | | | | | | | Position. | Cause. | |
| | | | | | | | Recover. | Death. | |
| 1 | Jan. 24, '88 | Arch.f.klin.Chir.xxxix. | Billroth. | Sarcoma pylorus, adherent pancreas. | Pylorectomy. | Suture. | ..... | 1 5 hrs. Collapse. | Ligation vena colica. |
| 2 | Apr. 2, '88 | " " " " | Eiselsberg. | Carcinoma pylorus | " & gastro-enterostomy. | " | ..... | 1 48 hrs. Perforative peritonitis | |
| 3 | " 26, '88 | " " " " | Billroth. | Sarcoma pylorus, and stomach. | Pylorectomy. | " | ..... | 1 4 ds. Peritonitis. | |
| 4 | July 4, '88 | " " " " | " | Cicatricial stenosis pylorus. | " | " | ..... | 1 48 hrs. Perforative peritonitis | |
| 5 | Sept. 7, '88 | Wien. klin. Woch., Jan. 31, '89. | Obalinski. | Carcinoma pylorus. | " | " | ..... | 1 .. | Death 18 wks. later. |
| 6 | Dec. 4, '88 | Arch.f.klin.Chir.xxxix. | Billroth. | Sarcoma abdominal wall, adherent stomach. | " partial. | " | ..... | 1 .. | Ventral hernia. |
| 7 | " 16, '88 | " " " " | " | Cicatricial stenosis pylorus. | " | " | ..... | 1 14 ds. Perforative peritonitis | |
| 8 | Jan. 13, '89 | " " " " | Eiselsberg. | Sarcoma pylorus. | " | " | ..... | 1 .. | |
| 9 | Apr. 8, '89 | " " " " | " | Cicatricial stenosis pylorus. | " | " | ..... | 1 .. | |
| 10 | " 12, '89 | " " " " | " | Sarcoma pylorus and pancreas. | " | " | ..... | 1 .. | Death 5 mo. later. Chronic pyæmia. |
| 11 | May 22, '89 | " " " " | Billroth. | Sarcoma pylorus and pancreas. | " | " | ..... | 1 33 hrs. Collapse. | |
| 12 | June 26, '89 | Brit. Med. Jour., May 3, '90. | Stokes. | Cancer pylorus, dilatation stomach. | " & gastro-enterostomy. | " | ..... | 1 11½ hrs. Collapse | |
| 13 | Oct. 16, '90 | Brit. Med. Jul. Mch. 12, '92. | McCormick. | Cancer pylorus, scirrhus. | Pylorectomy. | " | End. | 1 .. | |
| 14 | " 28, '90 | Daniels Tex. Med. Jour., Jan., '91. | Hadra. | Cancer stomach. | " | " Czerny-Lambert. | ..... | 1 .. | |
| 15 | Nov. 21, '90 | Münch. Med. Woch., May 24, '92. | Schönborn. | " pylorus, Dilatation. | " | Suture. | ..... | 1 7 ds. Exhaustion | |
| 16 | Dec. 10, '90 | Münch. med. Woch., May 24, '92. | " | Cancer pylorus. | " | " | ..... | 1 .. | |
| 17 | Feb. 13, '91 | Münch. med. Woch., May 24, '92. | " | " .. | " | " | ..... | 1 5 ds. Suppurative peritonitis. | |
| 18 | Mch. 9, '91 | Wien. klin. Woch., Nov. 17, '92. | Maydl. | " stomach. | " | " Maydl, E. S. | ..... | 1 .. | |
| 19 | Apl. 11, '91 | Hygieia, Sept., '91. | Borelius. | " .. | " | " Czerny-Lambert. | ..... | 1 8 days. | |
| 20 | May 9, '91 | Deut. med. Woch., Dec. 8, '92. | Mikulicz | " pylorus. | " & cholecystotomy. | Suture. | ..... | 1 .. | |
| 21 | July 7, '91 | Med. Chir. Trans., '92. | Robson. | " pylorus, stenosis. | Pylorectomy. | " | ..... | 1 5 ds. Exhaustion | |
| 22 | Sept. 17, '91 | Wien. klin. Woch., Nov. 3, '92. | v. Hacker. | Cancer pylorus. | " | " | ..... | 1 .. | |
| 23 | " '91 | Deut. med. Woch., Dec. 8, '92. | Mikulicz. | " .. | " | " | ..... | 1 .. | |
| 24 | Mch. 1, '93 | Ann. Surg., July, '93. | Lange. | " .. | " | " | ..... | 1 .. | |
| 1 | Aug. 4, '91 | Lancet, Oct. 24, '91. | Jassett. | Carcinoma pylorus | Pylorectomy and gastro-enterostomy. | Bone plates. | Lat. | 1 .. | |
| 1 | July 25, '93 | Unpublished. | Ferguson. | " .. | Pylorectomy and gastro-enterostomy. | Murphy but-E. S. | ..... | ..... | Time, 80 min., Sept. 3, 1893. Patient in good health. Dec. 15, patient gained 50 lbs. |
| 1 | Apl. 10, '90 | Med. Record, Apr. 19, '90. | Bull. | Carcinoma stomach and pylorus | Pylorectomy and gastro-enterostomy. | Abbe — catgut ring. | Lat. | 1 .. | " 1st successful American operation for cancer of stomach." |

CHOLECYSTENTEROSTOMY.

| No. | Date. | Publication. | Operator. | Diagnosis. | Operation. | Method. | Position. | RESULT. | | Remarks. |
|-----|---------------|---|--------------|---|------------------------------|--------------------|-----------|---------|---------------------------------|--|
| | | | | | | | | Recov. | Cause. | |
| 1 | May 4, '87 | Med. News, June 11, 1892. | Monastyrski. | Carcinoma head of pancreas. | Cholecysto-jejunostomy. | Suture. | Lat. | 1 | | Death 4 mos. later. |
| 2 | July 6, '87 | Gaillard's Med. Jour., Aug., 1892. | Kappeler. | Tumor pancreas. | Cholecysto-ileostomy. | Suture, Wölfler. | Lat. | 1 | | Death 15 mos. later. |
| 3 | Nov. 19, '87 | Corresp. bl. f. Schw., Socin. | | Carcinoma pancreas. | Cholecysto-enterostomy. | " | Lat. | 1 | | |
| 4 | April 24, '88 | Corresp. bl. f. Schw., Fritzsche. | | Carcinoma common duct. | Cholecysto-jejunostomy. | Elastic ligature. | Lat. | 1 | | |
| 5 | ..... | Centbl. f. Chir., 12, 1889. | Bardenheuer. | ..... | Cholecysto-enterostomy. | " " | Lat. | 1 | | |
| 6 | ..... | Centbl. f. Chir., 12, 1889. | " | ..... | Cholecysto-enterostomy. | " " | Lat. | 1 | | |
| 7 | Mch. 2, '89 | Med. Chir. Trans., 1890. | Robson. | Closure biliary fistula. | Cholecysto-colostomy. | Suture. | Lat. | 1 | | |
| 8 | Aug. 13, '89 | Rev. de Chir., 1892. | Terrier. | Occlusion common duct. | Cholecysto-duodenostomy. | " & drainage tube. | Lat. | 1 | | Death 1 yr. later. Influenza. |
| 9 | Mch. 28, '90 | Path. u. Chir. d. Gal | Courvoisier. | Complications following cholecystotomy. | Cholecysto-enterostomy. | Suture. | Lat. | 1 | | |
| 10 | Sept. 29, '90 | Samml. klin. Vorträge, Körte. | | Cholelithiasis. | Ob- Cholecysto-duodenostomy. | " | Lat. | 1 | 7 ds. Collapse. | 2d operation, Oct. 3. |
| 11 | Jan. 14, '91 | Berl. klin. Woch., 1892. | Lindner. | Closure biliary fistula. | Cholecysto-enterostomy. | " | Lat. | 1 | | |
| 12 | " 16, '91 | Deut. med. Woch., Sept. 3, 1891. | Sprengel. | Cholelithiasis. | Choledochoduodenostomy. | " | Lat. | 1 | | |
| 13 | May 21, '91 | Samml. klin. Vorträge, Körte. | | Cholelithiasis. | Ob- Cholecysto-duodenostomy. | " | Lat. | 1 | | |
| 14 | Nov. 2, '91 | Berl. klin. Woch., 1892. | Lindner. | Closure biliary fistula. | Cholecysto-enterostomy. | " | Lat. | 1 | | |
| 15 | " 16, '91 | Deut. med. Woch., Feb. 25, 1892. | Helferich. | Closure biliary fistula. | Cholecysto-jejunostomy. | " | Lat. | 1 | | |
| 16 | Aug. 13, '92 | Bull. et Mém. d. I. Reclus. | Reclus. | Cancer of pancreas (probable). | Cholecysto-enterostomy. | " | Lat. | 1 | | Reclus suggests "enterostomie biliaire." |
| 17 | " 28, '92 | Wien. klin. Woch., Jan. 19, 1893. | Fränkel. | Closure biliary fistula. | Cholecysto-enterostomy. | " | Lat. | 1 | 10 hours. Collapse. | |
| 18 | Sept. 27, '92 | Wien. klin. Woch., May 11, 1893. | Gersuny. | Cholelithiasis. | Ob- Cholecysto-gastrostomy. | " | Lat. | 1 | | |
| 19 | '92 | Beitr. z. klin. Chir., ix., h. 2, 1892. | Czerny. | Closure biliary fistula. | Cholecysto-enterostomy. | " | Lat. | 1 | Exhaustion. | |
| 20 | '92 | Beitr. z. klin. Chir., ix., h. 2, 1892. | " | Occlusion common duct. | Cholecysto-colostomy. | " | " | 1 | 2 weeks. Hemorrhage. | |
| 21 | '92 | Beitr. z. klin. Chir., ix., h. 2, 1892. | " | Occlusion common duct. | Cholecysto-duodenostomy. | " | " | 1 | | Temporary. |
| 22 | Jan., '93 | Boston M. & S. Jour., March 23, 1893. | Jones. | Closure biliary fistula. | Cholecysto-enterostomy. | " | Lat. | 1 | | |
| 23 | Feb. 1, '93 | Am. Gynecol. Jour., June, 1893. | Ross. | Obstruction common duct. | Cholecysto-duodenostomy. | Elastic ligature. | Lat. | 1 | 37 days' continuous hemorrhage. | |

MECHANICAL MEANS.

| | | | | | | | | | | |
|----|---------------|--------------------------------------|----------------|---|-----------------------------|--------------------------|------|---|---|---|
| 1 | Oct. 24, '91 | Lancet, March 12, 1892. | Chavasse. | Closure biliary fistula. | Cholecysto-colostomy. | Bone-plates. | Lat. | 1 | | |
| 2 | June 11, '92 | Med. Rec., Jan. 13, '94. | Murphy. | Cholelithiasis. | Cholecysto-enterostomy. | Murphy button. | " | 1 | | |
| 3 | Oct. 19, '92 | " " | " | " | Cholecysto-enterostomy. | " " | " | 1 | | |
| 4 | Nov. 23, '92 | " " | " | " | Cholecysto-enterostomy. | " " | " | 1 | | |
| 5 | Dec. 18, '92 | " " | " | " | Cholecysto-enterostomy. | " " | " | 1 | | |
| 6 | Jan. 31, '93 | " " | Lee. | " | Cholecysto-enterostomy. | " " | " | 1 | | |
| 7 | Feb. 20, '93 | " " | Murphy. | " | Cholecysto-duodenostomy. | " " | " | 1 | | |
| 8 | Mch., '93 | " " | Weir. | Cancer, pancreas, liver, omentum, gall-duct. | Cholecysto-enterostomy. | " " | " | 1 | Exhaustion. | "Death two hours after operation, not due to button but to disease." Perfect approximation. |
| 9 | April 6, '93 | Jnl. Am. Med. Assoc., Aug. 26, 1893. | Mayo. | Obstruction common duct. | Cholecysto-duodenostomy. | " " | " | 1 | | Patient 71 years old. |
| 10 | " 28, '93 | Medical Arena, Kansas City. | Foster, Wm. D. | Gall-bladder fistula. | Cholecysto-duodenostomy. | " " | " | 1 | | |
| 11 | May 6, '93 | Medical Record, Jan. 13, 1894. | Murphy. | Occlusion common duct. | Cholecysto-enterostomy. | " " | " | 1 | | |
| 12 | " 22, '93 | Unpublished. | " | Cholecystitis. | Cholecysto-enterostomy. | " " | " | 1 | | |
| 13 | " '93 | " | " | Cancer, pancreas, duodenum, gall-ducts and liver. | Cholecysto-jejunostomy. | " " | " | 1 | Ileus from volvulus 4 days. Loop of jejunum twisted upon itself before approximation to gall-bladder. | |
| 14 | June 1, '93 | " | Fabrique. | Hepatic colic. | Cholelithiasis. | Cholecysto-enterostomy. | " " | " | 1 | |
| 15 | " 1, '93 | " | Rogers. | Closure biliary fistula. | Cholelithiasis. | Cholecysto-enterostomy. | " " | " | 1 | 10th day removed button through fistula. |
| 16 | July 18, '93 | " | Hartmann. | Cholelithiasis. | Cholecysto-enterostomy. | " " | " | 1 | | |
| 17 | Aug. 3, '93 | " | Ferguson. | Dropsy gall-bladder. | Cholelithiasis. | Cholecysto-duodenostomy. | " " | " | 1 | |
| 18 | Oct. 26, '93 | " | Hartmann. | Cholelithiasis. | Ob- Cholecysto-enterostomy. | " " | " | 1 | | |
| 19 | Nov. 7, '93 | " | Murphy. | Cholelithiasis. | Cholecysto-enterostomy. | " " | " | 1 | | |
| 20 | Oct. 20, '93 | " | Luken. | " | Cholecysto-enterostomy. | " " | " | 1 | | |
| 21 | Sept. 20, '93 | " | Lane. | " | Cholecysto-enterostomy. | " " | " | 1 | | Button passed 12th day. |
| 22 | Jan. 6, '94 | " | Dunn, J. H. | Cholelithiasis. | Obs. of common duct. | Cholecysto-duodenostomy. | " " | " | 1 | |
| 23 | Feb. 13, '94 | " | Murphy. | Cholelithiasis. | Cholecysto-duodenostomy. | " " | " | 1 | | |
| 24 | Feb. 24, '94 | " | Abbe. | Obstruction of choledochus. | Cholecysto-duodenostomy. | " " | " | 1 | | |
| 25 | Feb. '94 | Bellevue Hospital R. | Barrows. | Biliary fistula. | Cholecysto-duodenostomy. | " " | " | 1 | | Fistula almost closed. |

ENTERO-ENTEROSTOMY.—I.

| No. | Date. | Publication. | Operator. | Diagnosis. | Operation. | Method. | Position. | RESULT. | | Remarks. |
|-----|---------------|--|--------------|---|----------------------------|--------------------------|-----------------|---------|------------------|--|
| | | | | | | | | Recov. | Death. | |
| 1 | Feb. 15, '88 | Arch. f. klin. Chir., 42, v. Baracz, 1891. | | Closure artificial anus. | Resection ileum. | Suture, Czerny-Lembert. | End. | 1 | .. | |
| 2 | June 5, '88 | N. Y. Medical Jour., McCosh, March 16, 1889. | | Strangulated hernia, gangrene. | Entero - enterostomy. | Suture. | Lat. | 1 | .. | |
| 3 | Oct. 30, '88 | Brit. Med. Jour., Mar. Franks, 2, 1889. | | Carcinoma transverse colon. | Colo-colostomy. | Gély. | End. | 1 | 2 days. | Ileus. |
| 4 | '88 | Med. & Surg. Report, Agnew, 59, 1888. |  | ..... | Ileo-ileostomy. | " | Czerny-Lembert. | Lat. | 1 | 1 day. Sutures gave way. |
| 5 | '88 | Med. Chir. Trans., '89 Inverson. | | Tumor sigmoid flexure. | Colo-colostomy. | Suture. | " | 1 | ..... | Intestino-vesical fistula. |
| 6 | '88 | Deut. Chir. (Sachs), Chwat, 32, 1891. |  | ..... | Resection jejunum. | ..... | ..... | 1 | ..... |  |
| 7 | '88 | Deut. Chir. (Sachs), Barton, 32, 1891. | | Epithelioma ileo-cæcal valve. | " | " | ..... | 1 | ..... |  |
| 8 | '88 | Deut. Chir. (Sachs), Hofmokl, 32, 1891. | | Carcinoma ascending colon. | " | " | ..... | 1 | ..... |  |
| 9 | '88 | Deut. Chir. (Sachs), " 32, 1891. | | Strangulated umbilical hernia. | " | " | ..... | 1 | ..... | Gangrene. |
| 10 | '88 | Wien. med. Blatt., 12, Obtusowicz, 1889. | | Prolapse intestine. | " | " | ..... | 1 | ..... |  |
| 11 | '88 | Deut. Chir. (Sachs), Lunnicher, 32, 1891. | | Strangulated inguinal hernia, gangrene. | " | " | ..... | 1 | ..... |  |
| 12 | '88 | Deut. Chir. (Sachs), Kaufman, 32, 1891. | | Closure artificial anus. | " | " | ..... | 1 | ..... |  |
| 13 | '88 | Deut. Chir. (Sachs), Park, 32, 1891. | | " " " fistula. | " | " | ..... | 1 | ..... |  |
| 14 | '88 | Deut. Chir. (Sachs), Bouilly, 32, 1891. | | Hernia. | " | " | ..... | 1 | ..... |  |
| 15 | '88 | Deut. Chir. (Sachs), Frey, 32, 1891. | | Inguinal hernia, gangrene. | " | " | ..... | 1 | ..... |  |
| 16 | '88 | Deut. Chir. (Sachs), Martino, 32, 1891. | | Inguinal hernia, gangrene. | " | " | ..... | 1 | ..... |  |
| 17 | '88 | Deut. Chir. (Sachs), " 32, 1891. | | Inguinal hernia, gangrene. | " | " | ..... | 1 | ..... |  |
| 18 | Feb. 12, '89 | St. Peter's Medical Wahl, 1889. | | Carcinoma colon. | Colo - sigmoidostomy. | Suture and rubber tubes. | Lat. | 1 | ..... | Koeberle clamp. |
| 19 | Mar. 17, '89 | Gaz. Med. di Torino, Caponatti, 1889. | | Closure artificial anus, hernia. | Entero - enterostomy. | " | " | 1 | ..... | Enterotome. |
| 20 | May 19, '89 | Arch. Gén. de Médicine, May, 1891. | | Closure artificial anus, stricture. | Entero-colostomy. | Suture. | " | 1 | ..... |  |
| 21 | July 2, '89 | MED. REC., Nov. 29, Meyer, 1889. | | Carcinoma colon. | Colo-colostomy. | " | Lembert. | " | 1 | |
| 22 | " 25, '89 | Rev. Méd. d. l. Suisse Comte, Rome, 6, 1890. | | Carcinoma small intestine. | Jejuno - jejunostomy. | " | " | 1 | ..... | Death 7½ mo. Extension of carcinoma. |
| 23 | " 28, '89 | Arch. f. klin. Chir., 42, v. Baracz, 1891. | | Closure artificial anus, hernia. | Resection ileum. | " | Czerny-Lembert. | End. | 1 | 1 d. Peritonitis. |
| 24 | Aug. 3, '89 | Lancet, Feb. 14, 1891. | Jessett. | Organic disease cæcum, obstruction. | Ileo-colostomy. | Suture. | E. S. | 1 | 13 days. | Exhaustion. |
| 25 | " 9, '89 | Rev. Méd. de la Suisse Comte, Rom. | | Pyo-ureteral cæcal fistula. | " | " | Lat. | 1 | ..... | Failure. Artificial anus re-established. |
| 26 | Sept. 18, '89 | Arch. f. klin. Chir., 42, v. Baracz, 1891. | | Sarcoma cæcum. | Resection ileum & cæcum. | " | Czerny-Lembert. | End. | 1 | 1 day. Shock. |
| 27 | Nov. 8, '89 | Tr. Roy. Acad. Med., Hayes, Ireland, 1891. | | Carcinoma transverse colon. | Colectomy. | Suture, Lembert. | " | 1 | ..... | Death 9 mos. Exhaustion. |
| 28 | " 14, '89 | Arch. f. klin. Chir., 41, Helferich, 1891. | | Strangulated hernia. | Entero - enterostomy. | Suture. | Lat. | 1 | Immediate Shock. | |
| 29 | '89 | Brit. Med. Jour., Nov. Sinclair, 16, 1889. | | Closure artificial anus, hernia. | Ileo-ileostomy. | " | " | 1 | ..... |  |
| 30 | Jan. 4, '90 | Dubl. Jour. Med. Sci., Franks, June, 1893. | | Valvulus small intestine, gangrene. | Entero - enterostomy. | " | Gély. | " | 1 | 2 days. Obstruction. |
| 31 | " 23, '90 | Deut. Zeit. f. Chir., 34, König, 1891. | | Stricture, tuberculous. | Enterectomy. | " | End. | 1 | ..... |  |
| 32 | Feb. 7, '90 | Gaz. Hebd. de Méd., Thiriar, 27, 1890. | | Closure artificial anus. | " | " | Gussenbauer. | " | 1 | ..... |
| 33 | " 24, '90 | Dan. Med. Hadra, Jour., Jan., 1891. | | Gunshot wound ileum. | " | Suture, Czerny-Lembert. | " | 1 | Few hours. | Peritonitis. |
| 34 | Mar. 28, '90 | Soc. de Chir., Paris, Boiffin, 1891. | | Stricture ascending colon. | Entero-colostomy. | Suture. | Lat. | 1 | ..... |  |
| 35 | April 14, '90 | Ctbl. f. Chir., 31, 1890. | Kredel. | Strangulated hernia. | Entero - enterostomy. | " | " | 1 | ..... |  |
| 36 | " 23, '90 | Arch. f. klin. Chir., 40, König, 1890. | | Sarcoma small intestine. | Enterectomy. | " | ..... | 1 | 24 hours. | Rupture intestine. |
| 37 | June 17, '90 | Am. Jour. Med. Sci., McIntosh, May, 1893. | | Closure artificial anus, adeno sarcoma. | Colo-colostomy. | " | Gély. | End. | 1 | ..... |
| 38 | " 21, '90 | Arch. Gén. de Méd., Chaput, June, 1891. | | Closure artificial anus, adeno sarcoma. | Entero - sigmoidostomy. | ..... | Lat. | 1 | ..... | ? Forceps. |
| 39 | July 25, '90 | Daniels, Tex. Med. Hadra, Jour., Jan., 1891. | | Ulceration ileum. | Enterectomy. | " | End. | 1 | ..... |  |
| 40 | Sept. 22, '90 | Deut. Zeits. f. Chir., König, 34, 1891. | | Stricture, tuberculous. | " | ..... | ..... | 1 | 3 days. | Shock. |
| 41 | Oct. 8, '90 | Lancet, Mar. 21, 1891. | Greig-Smith. | Closure artificial anus. | Enterorrhaphy. | " | End. | 1 | ..... |  |
| 42 | Nov. 5, '90 | Hosp. Tidende, April Hansen, 15, 1891. | | Strangulated hernia. | Enterectomy. | " | ..... | 1 | ..... |  |
| 43 | Dec. 11, '90 | Deut. Zeits. f. Chir., König, 34, 1891. | | Stricture, tuberculous. | " | " | ..... | 1 | 3 days. | Shock. |
| 44 | " 12, '90 | Verh. d. deut. Ges. f. Braun, Chir., 1892. | | Closure fæcal fistula, hernia. | Entero - enterostomy. | " | Lat. | 1 | ..... |  |
| 45 | " 17, '90 | Verh. d. deut. Ges. f. " Chir., 1892. | | Carcinoma small intestine, obstruction. | Entero - enterostomy. | " | End. | 1 | 3 hours. | Shock. |
| 46 | " 27, '90 | Revue de Chirurg., Llobet. | | Sarcoma mesentery. | Resection small intestine. | " | " | 1 | ..... |  |
| 47 | '90 | Daniels, Tex. Med. Hadra, Jour., Jan., 1891. | | Strangulated hernia. | Entero - enterostomy. | " | Czerny-Lembert. | Lat. | 1 | 6 hours. Sepsis. |
| 48 | '90 | Ctbl. f. Chir., 33, 1890. | Salzwedel. | " | Entero - enterostomy. | Suture. | Lat. | 1 | ..... | Failure. Closure of opening. Artificial anus established. |
| 49 | Dec. 18, '90 | v. Lukowicz. | | Gangrene. | Resection, 5½ in. | " | Czerny-Lembert. | End. | 1 | Time, 3 hours. |
| 50 | Jan. 15, '91 | Verh. d. deut. Ges. f. Braun, Chir., 1892. | | Closure fæcal fistula, hernia. | Entero - enterostomy. | Suture. | Lat. | 1 | 2 ds. | Gangrene, peritonitis. |
| 51 | " 19, '91 | Arch. Gén. de Méd., Reclus-Chaput, June, 1891. | | Closure artificial anus, tuberculous cæcum. | Enterorrhaphy. | " | Lat. | 1 | 2 days. | Tuberculosis. |
| 52 | Feb. 2, '91 | Wien. med. Woch., 39, Schramm, 1892. | | Gangrene mesentery. | Enterectomy. | " | Czerny. | 1 | ..... |  |
| 53 | " 18, '91 | Verh. d. deut. Ges. f. Braun, Chir., 1892. | | Closure fæcal fistula, hernia. | Entero - enterostomy. | " | Lat. | 1 | 4 ds. | Peritonitis. |
| 54 | " 20, '91 | Lancet, Feb. 6, 1892. | MacCormac. | Closure artificial anus, carcinoma. | Enterectomy. | " | Czerny-Lembert. | End. | 1 | Subsequent operation necessary. Tried Senn's plates. |
| 55 | Mar. 6, '91 | Nord. Med. Arkiv., 23, Studsgaard, 1891. | | Traumatic stricture ileum. | Resection small intestine. | Suture, Lembert. | " | 1 | ..... |  |
| 56 | May 5, '91 | Verh. d. deuts. Gesell. Braun, f. Chir., 1892. | | Ileus. | Entero - enterostomy. | Suture. | Lat. | 1 | Immediate. | Collapse. |

ENTERO-ENTEROSTOMY.—II.

| No. | Date. | Publication. | Operator. | Diagnosis. | Operation. | Method. | Position. | RESULT. | | Remarks. |
|-----|---------------|--|---------------|---|---|----------------------|--------------|---------|--------------------------------|--|
| | | | | | | | | Recov. | Cause. | |
| 57 | May 13, '91 | Med. Record, April 2, 1892. | Abbe. | Carcinoma sigmoid flexure. | Entero - enterostomy. | Suture. | Lat. | 1 .. | | |
| 58 | " 28, '91 | Wien. klin. Woch., 53, 1891. | Frank. | Carcinoma cæcum. | Ileo-colostomy. | " | End. | 1 .. | | |
| 59 | " 29, '91 | Med. Record, April 2, 1892. | Abbe. | Closure fæcal fistula. | Entero - enterostomy. | " | Lat. | 1 .. | | |
| 60 | June 18, '91 | Wien. Med. Woch., 39, 1892. | Schramm. | Gangrene mesentery. | Enterectomy. | " | ..... | 1 .. | | |
| 61 | July 16, '91 | Bull. et Mém. d. l. Soc. de Chir., Nov., 1891. | Le Dentu. | Fibromyoma of colon. | Colectomy. | " bert. | Lem-End. | 1 .. | | |
| 62 | " 23, '91 | Wien. klin. Woch., 27, 1892. | Frank. | Tuberculosis cæcum. | Resection. | Suture. | ..... | 1 .. | | |
| 63 | " 31, '91 | Lancet, Jan. 9, 1892. | Barker. | Intussusception. | Entero - enterostomy. | " ker. | Bar-Lat | 1 .. | 10 hrs. Gangrenous infection. | |
| 64 | Aug. 11, '91 | Deut. med. Woch., June 8, 1892. | Bier. | Closure artificial anus. | Entero - enterostomy. | Suture, bert. | Lem- " | 1 .. | 6 ds. Perforative peritonitis. | |
| 65 | " 15, '91 | Lancet, Jan. 9, 1892. | Barker. | Intussusception. | Entero - enterostomy. | Suture, ker. | Bar- " | 1 .. | 14 hours. | |
| 66 | " 15, '91 | St. Louis Courier Med., April, 1892. | Young. | Trauma colon. | Colectomy. | Suture. | End. | 1 .. | | |
| 67 | " 22, '91 | Wein. Med. Presse, 12, 1892. | Rosenthal. | Strangulated hernia. | Resection. | " bert. | Lem- | 1 .. | | |
| 68 | Sept. 6, '91 | Deut. Zeits. f. Chir., 34, 1892. | König. | Stricture tuberculosis. | Colectomy. | Suture. | ..... | 1 .. | 5 ds. Collapse. | |
| 69 | " 23, '91 | Dublin Jour. Med. Sci. | Frank. | Hernia gangrene. | Entero - enterostomy and enterorrhaphy. | " Gély. | End. | 1 .. | | |
| 70 | Oct. 1, '91 | Boston M. & S. Jour., March 3, 1892. | Richardson. | Closure artificial anus, hernia. | Enterectomy. | " bert. | Lem- " | 1 .. | | |
| 71 | " 8, '91 | Verh. d. deut. Gesell. f. Chir., 1892. | Braun. | Closure fæcal fistula. | Entero - enterostomy. | Suture. | Lat. | 1 .. | | |
| 72 | Nov. 3, '91 | Gac. Med. di Mexico, Dec. 15, 1892. | Zarraga. | Closure artificial anus. | Entero - enterostomy. | " | S. | 1 .. | | |
| 73 | " 14, '91 | Med. Record, Apr. 9, 1892. | Weir. | Penetrating wound. Strangulated hernia. | Ileo-colostomy. | " bert. | Lem-Lat. | 1 .. | | |
| 74 | Dec. 1, '91 | Tr. Am. Surg. Assoc., 1892. | McCann. | Sarcoma mesentery. | Enterectomy. | Suture. | End. | 1 .. | | |
| 75 | " 12, '91 | Verh. d. deut. Gesell. f. Chir., 1892. | Braun. | Tumor " | Entero - enterostomy. | " | Lat. | 1 .. | Few hours. Collapse. | |
| 76 | " 14, '91 | Deut. Zeits. f. Chir. B., 34, 1892. | König. | Stricture tuberculosis. | Enterectomy. | " | ..... | 1 .. | | |
| 77 | " 28, '91 | Med. Record April 2, 1892. | Abbe. | Strangulated hernia. | " | " | " | 1 .. | | |
| 78 | " 9, '91 | Internat. Clinics, 3, '91. | Carmalt. | Cancer cæcum. | " | " | Lembert-End. | 1 .. | | |
| 79 | Jan. 9, '92 | Bull. et Mém. d. l. Soc. de Chir., March, '92. | Berger. | Closure artificial anus. | Enterorrhaphy. | " | " | 1 .. | | |
| 80 | " 13, '92 | Verh. d. deut. Gesell. f. Chir., 1892. | Braun. | Ileo-colic invagination. | Ileo-colostomy. | " | " | 1 .. | | |
| 81 | Feb. 13, '92 | Verh. d. deut. Gesell. f. Chir., 1892. | " | Ileus. | Entero - enterostomy. | " | " | 1 .. | | |
| 82 | March 20, '92 | Wien. klin. Woch., 27, 1892. | Frank. | Tuberculosis cæcum. | Resection. | " | " | 1 .. | | |
| 83 | " 27, '92 | N. Y. Med. Jour., Sept. 10, 1892. | Hartley. | Carcinoma; intussusception. | " | Suture Maunselle. | End. | 1 .. | | |
| 84 | June 8, '92 | Va. Med. Monthly, Nov., 1892. | Earle. | Closure artificial anus. | Colectomy. | Suture, sted. | Hal- | 1 .. | | |
| 85 | " | N. Y. Med. Jour., Sept. 3, 1892. | Kammerer. | ..... | ..... | " Abbe. | Lat. | 1 .. | | Death 4 mos. later. No contraction of opening. |
| 86 | " | Lyon Médical. | Jaboulay. | ..... | ..... | Suture Gus-senbauer. | End. | 1 .. | | Artificial anus. |
| 87 | " | " | " | ..... | ..... | Suture. | " | 1 .. | | |
| 88 | " | " | " | ..... | ..... | " | " | 1 .. | | |
| 89 | " | Semaine Méd., Jan. 16, 1892. | Larabrie. | ..... | ..... | Suture, bert. | Lem-Lat. | 1 .. | | (No resection.) |
| 90 | " | Gaz. d. Osp., 89, 1890. | Mazzucchelli. | ..... | ..... | Suture, ny. | Czer-End. | 1 .. | | |
| 91 | " | Intern. klin. Rundschau, May 29, 1892. | Hofemokl. | Intussusception. | Colo-colostomy. | Suture. | " | 1 .. | | |

button together. The operation can be performed in from thirty to forty minutes. It leaves the end of stomach securely closed and the end of duodenum firmly approximated to the peritoneal surface of stomach, conditions which are favorable for immediate union. This operation has the following advantages: 1. The danger of shock is very materially lessened by the great reduction of time, *i.e.*, from two and a half hours to thirty to forty minutes. 2. The end of stomach is securely closed. 3. There is a uniform pressure in approximation of duodenum to stomach. 4. The danger of peritonitis is lessened because the peritoneal surface has not been exposed to the atmosphere nor manipulated sufficiently to abrade the endothelial layer on its surface; consequently the likelihood of infection is lessened.

Case I. was one of Dr. Alexander Hugh Ferguson's, Winnipeg, Manitoba; who writes as follows: "I used your Anastomosis Button four days ago in a gastro-duodenostomy (end to side) after pylorotomy for cancer. The time from taking the knife to complete closure of abdomen, one hour and twenty minutes. Since the operation there has been no vomiting, no tympanites, restlessness nor pyrexia. The pulse at its highest was 108. The largest size button suited admirably, and I am sure shortened the time one-half."

August 14th.—"My case of pylorotomy has made an uninterrupted recovery. The button was voided sixteen days and ten hours after operation. He is now eating meat, potatoes, etc., which he has not done for five years."

September 1st.—Patient discharged from the hospital on the twentieth day, apparently in perfect health. He has gained five pounds since the operation.

December 28th.—Patient has gained fifty pounds since operation."

Cholecystenterostomy.—Probably the most difficult of all approximations to make by the suture is that of uniting the gall-bladder to the intestinal tract. The results from experimental research by this method were very unsatisfactory, and the verdict of Gaston, Harley, Colzi, De Paige, and others who pursued these experiments industriously, was that it was a hazardous operation and one very difficult of execution. This opinion was verified by the difficulties and dangers experienced by the pioneers of this operation. It took von Winiwarter sixteen months, with six operations, to perform a successful cholecystocolostomy.

In commenting on cholecystenterostomy by means of suture, Kappeler, Fritzsche, Robson, Courvoisier, Socin, Bardenheuer, and others, say it is an operation very diffi-

ENTERO-ENTEROSTOMY.—III.

| No. | Date. | Publication. | Operator. | Diagnosis. | Operation. | Method. | Result. | | | Remarks. |
|-----|---------------|-------------------------------------|----------------|---------------------------------------|--------------------------|------------------------------------|-----------|--------|--------|---|
| | | | | | | | Position. | Recov. | Death. | Cause. |
| 1 | Nov. 14, '88 | N.Y. Med. Jour., Mar. 28, 1889. | Abbe. | Closure artificial anus. | Colo-colostomy. | Bone plates. | Lat. | 1 | .. | |
| 2 | Aug. 17, '89 | N.Y. Med. Jour., Dec. 20, 1890. | Russell. | Stenosis small intes- | Jejuno-ileostomy. | " " | " | 1 | .. | |
| 3 | Oct. 9, '89 | Jour. Am. Med. As., June 14, 1889. | Senn. | Carcinoma cæcum. | Ileo-colostomy. | " " | " | 1 | .. | |
| 4 | Nov. 14, '89 | Jour. Am. Med. As., June 14, 1889. | " | Carcinoma ileo-cæcal valve. | " " | " " | " | 1 | .. | 6 days Peritonitis. |
| 5 | Dec. 27, '90 | Boston M. & S. Jour., Nov. 5, 1891. | Homans. | Obstruction, invagina- | Entero - enterostomy. | " " | " | 1 | .. | |
| 6 | July 18, '91 | Northw. Lancet, May 15, 1893. | Graff. | Strangulated femoral hernia. | Entero - enterostomy. | " " | " | 1 | .. | |
| 7 | Aug. 7, '91 | Brit. Med. Jour., April 22, 1893. | Morison. | Malignant stricture ileo-cæcal valve. | Ileo-colostomy. | " " | " | 1 | .. | Death 10 weeks later. Bronchitis. |
| 8 | " 24, '91 | Lancet, April 16, 1892. | Littlewood. | Carcinoma, hepatic flexure, colon. | Ileo sigmoidostomy | " " | " | 1 | .. | |
| 9 | " 26, '91 | Northw. Lancet, May 15, 1893. | Graff. | Strangulated femoral hernia. | Entero - enterostomy. | " " | " | 1 | .. | Necrotic belt fastened in lumen of bowel. |
| 10 | Sept. 14, '91 | Northw. Lancet, May 15, 1893. | " | Strangulated femoral hernia. | Entero - enterostomy. | " " | " | 1 | .. | 4 days Faulty operation. |
| 11 | Nov. 26, '91 | Lancet, May 7, 1892. | Atkinson. | Acute intestinal obstruction. | Entero-colostomy. | " " | " | 1 | .. | Short circuit. |
| 12 | Feb. 21, '92 | Brit. Med. Jour., April 30, 1892. | Wright. | Closure artificial anus, hernia. | Entero - enterostomy. | " " | " | 1 | .. | |
| 13 | " | Brit. Med. Jour., April 30, 1892. | Barling. | Malignant disease ascending colon. | Ileo-colostomy. | " " | " | 1 | .. | 6 ds. Gangrene. |
| 14 | Jan. 24, '93 | Lancet, Mar. 25, 1893. | Lowson. | Closure artificial anus. | Ileo-colostomy. | Robson's bone bobbin. | " | 1 | .. | |
| 15 | " | Brit. Med. Jour., April 1, 1893. | Robson. | Injury ileum during ovariectomy. | Ileo-ileostomy. | Potato-plates. | " | 1 | .. | Few hours. Shock. |
| 16 | " | Ann. Surg., Feb., 1893. | Currier. | Stricture intestine. | Ileo-colostomy. | Robinson, segmented rubber plates. | " | 1 | .. | 10 hrs. Peritonitis. |
| 17 | " | Unpublished. | Martin. | Closure fecal fistula. | Enterectomy. | Abbe - catgut rings. | Lat. | 1 | .. | |
| 18 | Mar. 22, '89 | Med. News, June 1, 1889. | Abbe. | Malignant stenosis ileum. | Ileo-ileostomy. | Abbe - catgut rings. | " | 1 | .. | 6 hrs. Exhaustion. |
| 19 | Dec. 22, '89 | Med. Record, April 2, 1893. | " | Closure artificial anus. | Ileo-colostomy. | Abbe - catgut rings. | " | 1 | .. | 40 hrs. Shock, peritonitis. |
| 20 | Sept. 11, '90 | N.Y. Med. Jour., Dec. 20, 1890. | Richmond. | Strangulated hernia. | Entero - enterostomy. | Abbe - catgut rings. | " | 1 | .. | |
| 21 | " | N.Y. Med. Jour., April 19, 1890. | Manley. | Intestinal obstruction. | Ileo-colostomy. | Davis - catgut mats. | " | 1 | .. | 14 hrs. Exhaustion. |
| 22 | July 16, '89 | N.Y. Med. Jour., Sept. 14, 1889. | Davis. | Closure artificial anus, hernia. | Ileo-colic implantation. | Rubber rings and sutures. | E. S. | 1 | .. | Also resection of prolapsed bowel. |
| 23 | June 11, '91 | Guy's Hosp. Reports, 1891. | Davies-Colley. | Malignant stricture ileum. | Ileo-ileostomy. | Ashton - rubber rings. | End. | 1 | .. | |
| 24 | Nov. 30, '91 | Maryland Med. Jour., July 2, 1892. | Ashton. | Closure artificial anus. | Enterorrhaphy. | Milton - gelatine tube. | " | 1 | .. | |
| 25 | " | Lancet, Sept. 24, 1892. | Milton. | Strangulated hernia. | Enterectomy. | Paul - bone tube. | " | 1 | .. | |
| 26 | " | Brit. Med. Jour., May 21, 1892. | Paul. | | | | | | | |

OPERATIONS WITH MURPHY BUTTON.

| | | | | | | | | | | |
|----|---------------|-------------------------------------|-------------------|--|---|---------------|-------|---|----|---|
| 1 | Dec. 8, '92 | Report of Cases. | Walker. | Strangulated hernia. | Resection intestine, 4 in. | Murphy button | End. | 1 | .. | First end-to-end approximation by button. Oct. 21, 1893, patient in perfect health. |
| 2 | Jan. 30, '93 | Ann. Surg., June, 1893. | Keen. | Carcinoma, hepatic flexure, colon. | Ileo-colostomy. | " " | E. S. | 1 | .. | Death 47 ds. later. Ulcer ascending colon. |
| 3 | Mar. 25, '93 | Med. & Surg. Report, Sept. 9, 1893. | Sutton. | Closure artificial anus without resection. | Lateral anastomosis. | " " | Lat. | 1 | .. | August 20, excellent health. |
| 4 | April 3, '93 | Unpublished. | E. Wylls Andrews. | Femoral hernia, gangrene. | Resection intestine, 18 in. | " " | End. | 1 | .. | November 21, excellent health. |
| 5 | June 5, '93 | " | Murphy. | Intestinal strangulation, band from dermoid. | Resection intestine, 2 in. | " " | " | 1 | .. | Time for approximation, 5½ minutes. |
| 6 | July 8, '93 | " | Bacon. | Stricture rectum. | Bacon's operation on rectum. | " " | Lat. | 1 | .. | Nov. 25, good calibre. Neither pain nor discharge. Rectum soft and pliable. |
| 7 | " 10, '93 | " | Murphy. | Umbilical hernia, gangrene, peritonitis. | Resection intestine, 5 in. | " " | End. | 1 | .. | 48 hrs. Continued peritonitis. |
| 8 | " 13, '93 | " | McCall. | Fæcal fistula, gangrene. | Lateral anastomosis. | " " | Lat. | 1 | .. | |
| 9 | Sept. 10, '93 | " | Murphy. | Fæcal fistula. | Lateral anastomosis without resection. | " " | Lat. | 1 | .. | Time, 6 min. Oct. 24, well; fistula closed. |
| 10 | " 23, '93 | " | " | " " | Lateral anastomosis without resection. | " " | " | 1 | .. | Time, 7 minutes. |
| 11 | Oct. 17, '93 | " | Ruth. | Tumor cæcum. | Resection cæcum and colon, 2 in. | " " | End. | 1 | .. | Obstruction 6 mos.; child 6 yrs. Nov. 15, excellent health. Discharged 20th day. |
| 12 | " 19, '93 | " | Marcy. | Cancer rectum. | Kraske resection rectum, 4 in. | " " | " | 1 | .. | |
| 13 | Nov. 12, '93 | " | Bouffleur. | Femoral hernia, 5 days' obstruction. | Resection intestine, 4 in. | " " | " | 1 | .. | Time, 4½ minutes. |
| 14 | " 16, '93 | " | Cordier. | Ileus, cicatricial band. | Entero - enterostomy. | " " | Lat. | 1 | .. | |
| 15 | " 19, '93 | " | Rogers. | Inguinal hernia, gangrene. | Resection intestine, 10 in. | " " | End. | 1 | .. | Button passed 7th day. |
| 16 | Jan. 14, '93 | " | Murphy. | Annular stricture rectum. | Application of button. | " " | " | 1 | .. | |
| 17 | Dec. 11, '93 | " | Ferguson. | Cancer cæcum. | Resection of cæcum. | " " | " | 1 | .. | Report 8 days after operation. |
| 18 | Sept. 1, '93 | " | Beck. | Carcinoma stomach pylorus. | Maydl's operation with lateral approximation. | " " | E. S. | 1 | .. | |
| 19 | Dec. 12, '93 | " | McBurney, Murphy. | Fæcal fistula. | " | " " | S. S. | 1 | .. | Button passed 9th day through fistula. |
| 20 | Jan. 15, '94 | " | Ferguson. | " " | Resection end of ileum, side of colon. | " " | E. S. | 1 | .. | Button passed 16th day through fistula. |
| 21 | Feb. 3, '94 | " | Jos. Price. | Sigmoid adherent to malignant cyst. | Enterectomy, 6 in. | " " | E. E. | 1 | .. | Button passed 9th day. |
| 22 | Feb. 10, '94 | " | Carl Beck. | Fæcal fistula. | Duodenojejunosomy (Maydl). | " " | S. S. | 1 | .. | Button passed 20th day. |
| 23 | Feb. 24, '94 | " | Willy Meyer. | Carcinoma of pylorus. | Pylorotomy. | " " | E. S. | 1 | .. | Button voided 21st day. |

ENTERO-ENTEROSTOMY.—III. (Continued.)

| No. | Date. | Publication. | Operator. | Diagnosis. | Operation. | Method. | RESULT. | | Remarks. |
|------------------|------------------------|--------------------------------|--|----------------------------------|---------------|------------|-----------|--------|--|
| | | | | | | | Position. | Cause. | |
| | | | | | | | Recess. | Death. | |
| 24 Mar. 3, '94 | Unpublished. | Willy Meyer. | Ileum involved in sarcoma. | Resection, 15 inches ileum. | Murphy Button | E. 1 .. | | | |
| 25 Jan. 2, '94 | " | W. T. Dodge, Big Rapids, Mich. | Fæcal fistula, small intestine. | Resection, 3 inches ileum. | " | E. 1 .. | | | Button voided 8th day. |
| 26 Feb. 16, '94 | " | W. T. Dodge, Big Rapids, Mich. | Fæcal fistula, large intestine. | Resection, 3 inches colon. | " | E. 1 .. | | | Button passed 8th day. |
| 27 May, '94 | " | W. T. Dodge, Big Rapids, Mich. | Ileum adherent to ovarian cyst. | Resection of ileum. | " | E. 1 .. | | | Patient died 11 days later from a complication; perfect union; button found in rectum. |
| 28 Mar., '94 | Lancet, April 21, '94. | A. Lane, London, Eng. | Sarcoma of mesentery of sigmoid. | Resection of 12 inches of colon. | " | E. 1 .. | | | Button voided 8th day. |
| 29 May 9, '94 | Unpublished. | Jos. D. Bryant. | Fæcal fistula (had previous operations). | Ileo-colostomy. | " | S. S. 1 .. | | | Oblong button used for the first time, passed on 15th day. |
| 30 May 14, '94 | " | Geo. F. Shrady. | Fæcal fistula. | Lateral approximation | " | S. S. 1 .. | | | |
| 31 Feb. 12, '94 | " | C. McBurney. | Tumor of cæcum. | Ileo-colostomy. | " | | | | Infection occurred. See details in history of case. |
| 32 April 27, '94 | " | E. Abbe. | Obstruction of colon (malignant). | Lateral anastomosis. | " | S. S. 1 .. | | | |

cult of performance. The number of operations performed by means of suture, up to the present time, is 23, with 8 deaths; a mortality of 34.8 per cent.; number of operations performed by mechanical means for cholelithiasis, 24, 24 recoveries. Of these 1 bone plate, recovery; 23 Murphy button, 23 recoveries. Number of operations in cases of cancer involving pancreas, duodenum, gall-bladder, and liver, 2, with two deaths. The death, in a case reported by Dr. Weir, was due to the disease, and not to the method, and occurred two hours after operation; in the other, a case of my own, to a twisting of the bowel upon itself before the approximation was made, as shown in autopsy.

A comparison of these results shows that the operation by mechanical means produces most excellent results; in fact, all that could be desired. It needs no other comment. The explanation of this favorable showing is: 1. That the operation can be performed in an extremely short time (in less than twenty minutes) compared to that by suture, thereby lessening the danger from shock, and also of peritoneal infection from prolonged manipulation and exposure. 2. There is an uniform coaptation of gall-bladder to duodenum which is very favorable to, or better still, insures a union; as there has not been in the human subject, nor in the animals experimented on by this method, a single failure of union. The pressure also prevents hemorrhage, which is one of the dangers of suture, as two patients died from that cause. 2. There is an immediate restoration of bile to the alimentary canal, and an assurance that none of it will escape into the peritoneal cavity at the line of approximation.

I believe that the operation of cholecystenterostomy by mechanical means will supersede all other operations on the gall-bladder, in suitable cases.¹

Entero enterostomy.—In treating this subject we will not take up the various methods of approximation that are now only of historic interest, but will consider the methods that have been employed and reported in operations in the last six years, as will be seen in tabulated statement. These methods we will arrange as in the previous classification: 1, Simple suture; 2, mechanical means; and 3, suture with mechanical aid. The pathological conditions which create the necessity for a resection of a portion of the bowel are of three classes: the order of frequency in which they occur is, 1, strangulated hernia; 2, ileus (intestinal obstruction); (a) strangulation, (b) obturation; 3, intestinal perforations, (a) traumatic, (b) pathological; 4, neoplasms. There will always be a considerable percentage of mortality from the intrinsic dangers of the pathological conditions, aside from the defects of the means employed for their relief.

¹ See MEDICAL RECORD for February, 1894, for detailed report of first series of these cases.

Therefore the problems to be solved are: 1, How can we reduce the intrinsic dangers of the disease? and, 2, How can we minimize the difficulty and danger of the operative procedure *per se*?

In order to decide the first problem, that is, the intrinsic danger, the subject of diagnosis must be exhaustively considered, as the dangers of the disease depend in a large measure upon the failure of early diagnosis. This is particularly true of ileus, and I feel constrained to further emphasize, in connection with this subject, the imperative importance of early and accurate diagnosis, as the result in operations of this class depends more than in any other upon an early recognition of the pathological condition. The difficulty of making a positive diagnosis of the pathological lesion producing the obstruction has been materially diminished by our modern advancements, but is not generally understood nor practised. This necessarily increases the danger to the patient, as the operation is postponed until extreme symptoms manifest themselves. With exploratory laparotomy for ileus, but little difficulty is encountered, although it is occasionally impossible to locate the seat of obstruction. In 190 laparotomies for ileus collected by Schramm, the operators failed in 8 cases to locate the obstruction.

Diagnosis.—There is only one way to obtain good results in ileus, that is by early diagnosis and operation. In this we must consider every case of ileus as we would an acute strangulated hernia; we know that an early operation for strangulated hernia admits of a much more favorable prognosis than one which is delayed until the intestine is gangrenous. How much more important is it that the early operation should be performed in internal strangulation where gangrene would take place within the peritoneal cavity! What physician would allow a strangulated hernia to go unrelieved one night? On the other hand, what is the practice of physicians in cases of internal strangulation? They allow not only one night, but two, three, four days and nights to elapse—yes, even to the stage of collapse—before the strangulated bowel is relieved. Only a few days ago I was called to operate in a case of recognized intestinal obstruction of six days' standing; there was not the slightest sign of pulse; the patient's extremities were cold to the trunk; every other respiration was that prolonged heavy sigh that we find in these cases preceding dissolution. It is needless to say no operation was performed.

This is what is called conservatism; *criminal procrastination* is a more proper term. Can we expect, under such circumstances, good results from any method of operation? Do statistics offer sufficient inducements under the treatment by opiates, stomach and bowel irrigations, etc., to justify us in waiting, depending upon a favorable

accident to rescue the patient? No. *Expectant treatment in abdominal lesions is only justifiable when the diagnosis of intestinal obstruction is positively excluded.* The only rational outcome to expect from so-called conservative treatment of ileus is death. The differential diagnosis of intestinal obstruction is not very difficult to make if the symptoms have not been masked by the use of opiates.

To assist in the diagnosis, I submit the following excellent synopsis from von Zöge-Manteuffel:

I. STRANGULATION ILEUS.

| Pathological Changes. | Clinical Symptoms. |
|---|--|
| 1. Localized meteorismus, dislocation of the strangulated coil. | 1. (a) Asymmetry of the abdomen; (b) localized increased resistance. |
| 2. Ischæmia, paralysis of the strangulated loop of intestine. | 2. Complete inactivity of the abdominal wall over the strangulated coil; absence of peristalsis. |

In this category are included: 1, Volvulus, agglutination, twisting of the intestine on the axis of its mesentery; 2, strangulation by bands and diverticula; 3, incarceration in pre-formed openings; 4, invagination.

2. OBTURATION ILEUS.

| Pathological Conditions. | Clinical Symptoms. |
|---|--|
| 1. Meteorismus produced by accumulation above the obstruction. | 1. Perceptible asymmetry, palpable resistance in obstruction of the large intestine, obstruction of the small intestine, diffuse tympanites. |
| 2. (a) No pronounced disturbance of circulation. (b) Hypertrophy of the intestinal muscles above the obstruction in the chronic form, in the large intestine. | 2. (a) Peristalsis to be observed or felt. (b) Greatly exaggerated peristalsis. |

To this group belong: 1, Strictures; 2, twisting of the intestinal axis; 3, obstruction by neoplasms or foreign bodies; 4, compression by tumors from without.

It is a fact that in certain forms of intestinal occlusion (strangulation ileus in contrast with obturation ileus) a definite portion of the intestine suffers from an abnormal fixation and distention, which on inspection can be recognized by the asymmetry of the abdomen, and determined and outlined by careful palpation.

The one pathological condition from which it is most difficult to differentiate ileus is perforative peritonitis, but there are two symptoms upon which great reliance may be placed.

1. *In the early stage of perforative peritonitis there is an elevation of temperature; in intestinal obstruction, no elevation of temperature.*

2. *In perforative peritonitis there is a paralysis of peristalsis over inflamed area; in intestinal obstruction there is a very great increase in the peristalsis,* which continues until necrosis of the bowel takes place or a peritonitis is developed. Frequent auscultation of the abdomen, as an aid to diagnosis of intestinal obstruction, is of as much value as auscultation of the chest in arriving at a diagnosis in pulmonary diseases. With the stethoscope, or ear, upon the abdomen, in the early stage of intestinal obstruction, there is a constant rumbling and rolling of the contents of the intestine, and manifestations of stormy peristaltic action. These manifestations are most marked at the seat of obstruction, and, indeed, the location of the obstruction can frequently be ascertained by these signs alone. If this peristalsis should momentarily subside, it can be brought on with increased violence by manipulation of the abdomen. A dose of opium will suppress the peristaltic action of the intestine for hours, while a chloroform narcosis does not interfere with it. It should therefore be impressed on every physician that no opiates should be given in acute lesions in the peritoneal cavity until the question of diagnosis is decided. In ileus, where active peristalsis has subsided and cannot be reproduced by pressure, it is an indication that peritonitis has ensued, and the prognosis of the operation is proportionately grave. A symptom of importance is a very circumscribed

dullness near or at the seat of obstruction, due to accumulation in the proximal portion of the bowel,¹ and a meteoric distention of the strangulated loop itself, due to obstructed circulation and decomposition of its contents, producing a rapid gaseous distention and complete paralysis of the wall.² Kadar's experiments show that the distention of the strangulated loop is not due to gas and intestinal contents forced into the loop from the proximal side, as was formerly supposed, but is principally due to disturbances of the circulation in the intestinal wall, and consists of a uniform expansion of the entire intestine which is produced by, (1) thickening of the wall; (2) accumulations of fluid; (3) development of gas from fermentation within the loop. This condition he produced experimentally by ligation of the mesenteric vessels after a ligature of the intestine on the proximal side of the portion in which the circulation was obstructed, the distal end being free, still the intestine was dilated. This has great bearing in all operations of intestinal approximation, as it accounts for the paralysis and distention occurring where a greater portion of the mesenteric side of the bowel is removed than on the convex side.

The outlines of dullness in various intestinal obstructions given by von Zöge-Manteuffel are interesting and instructive. An irregularity on the surface of the abdomen, supported by an increased circumscribed resistance and tension of the underlying coil of intestine, points definitely to an obstruction at the seat of that distended coil—a local meteorismus.³

It will be admitted that a definite diagnosis of the pathological condition producing the obstruction may not be possible. Does that prevent us from operating? No. Will waiting help the patient, or will it even assist in making the diagnosis? No. Every hour lessens the patient's resistance and increases local destruction or necrosis. Still every day we meet with cases in which this policy of procrastination is pursued until the patient is moribund; finally, and unfortunately too often, we are forced to operate under just these unfavorable circumstances.

When we operate under these conditions are we warranted in abandoning the search for the cause of obstruction and its removal, for the establishment of an artificial anus? I think not. Saltzman states that laparotomies for ileus, with removal of cause of obstruction, up to 1883 had a mortality of 71.3 per cent.; simple enterotomy, without removal of cause, 67.3 per cent. So hopeless were the results of laparotomies with the removal of cause that such surgeons as Madelung, Mikulicz, Schede, Shoenborn, who were formerly strong advocates of this operation, abandoned it for simple enterotomy to relieve the obstruction. The indications for the latter operation they attempted to extend even with a slight percentage in its favor, and the comparative certainty that a second operation would be necessary. The establishment of a fecal fistula in this class of cases should be permitted only as a last resort in a profoundly collapsed patient, as we have now means at hand for removing the necrotic intestine and re-establishing its continuity in a much shorter time than a fecal fistula can be formed. The more acute the attack and persistent the pain, the more pronounced the collapse, the more probable the existence of complete strangulation and local necrosis. There is, however, no positive symptom of necrosis.

If the foregoing principles are adhered to, the intrinsic dangers of intestinal obstruction can be reduced to a minimum. As a matter of necessity the surgeon must see the case early, examine it carefully, and must be allowed to name the time of operation.

If we were asked what we considered the greatest danger in intestinal obstruction, would the answer not be, not the ileus, not the gangrene, not the peritonitis, but the lamentable failure to make an early and correct diagnosis; or still worse, the lack of courage, having made it, to act upon it. In other words, the fault is not

¹ Schede, Schlange.

² L. Rehm, Frankfurt.

³ Von Wahl.

in defects in nature, whereby these accidents are permitted to occur, but in the doctor for allowing the lesions to progress unrecognized or unrelieved beyond the possibility of rescue by surgical interference.

Leichtenstern, Peyrot, and Treves have endeavored, through careful analysis and classification of the history, symptoms, and physical signs, to make a definite diagnosis of the nature of the mechanical obstruction and of the portion of intestine obstructed. Leichtenstern expresses his views as follows: "The object of our diagnosis before the operation is performed is to designate the anatomical and pathological conditions by the history, symptoms, and physical signs, and thereby to ascertain not only that an obstruction exists, but also the position, cause, and nature of the obstruction." In a few cases this has been accomplished, but in the great majority it was impossible to arrive at such conclusions with any degree of certainty, and I feel that Schede has expressed the condition exactly as it exists, and includes all that is of vital importance to operators in the following words: "The greatest difficulty rests, and will for a long time rest, in the diagnosis. I will not even once mention, in considering the diagnosis, the nature of the obstruction, nor the portion of intestine obstructed. I will be satisfied if in a given case, at a given time, the presence of an obstruction to the passage of feces can be determined, which obstruction it is impossible to relieve by any other means than the surgeon's knife."

Dr. P. Poppert, of Giesen, comments as follows on the cause of death after operation for ileus: "The majority of cases of ileus are already severely depressed—yes, collapsed, when they come for operation; for this kind of depressed patients every long operative procedure, which is accompanied by extensive opening of abdomen and exposure of its contents, will prove fatal; consequently a large percentage of laparotomies of this class die shortly after the operation, from heart failure."

LATERAL APPROXIMATION.

| | Cases. | Recoveries | Deaths. | Not Given. | Mortality Percentage |
|---|--------|------------|---------|------------|----------------------|
| Suture | 33 | 20 | 12 | 1 | 36.4 |
| Suture with mechanical aids | 23 | 18 | 5 | — | 21.7 |
| Of these, bone plates..... | 14 | 11 | 3 | — | 21.4 |
| Robson's bone bobbin..... | 1 | 1 | — | — | — |
| Potato plates..... | 1 | — | 1 | — | 100.0 |
| Robinson's raw-hide segmented plates..... | 1 | — | 1 | — | 100.0 |
| Abbe rings..... | 4 | 1 | 3 | — | 75.0 |
| Davis mats..... | 1 | — | 1 | — | 100.0 |
| Mechanical means, Murphy button..... | 11 | 11 | — | — | — |
| Total | 66 | 43 | 21 | 1 | 31.8 |

The operation of lateral approximation (anastomosis proper) is distinctly a modern operation, as it was first successfully performed by von Hacker, of Vienna, 1886. It rapidly gained adherents on account of the great mortality following the operation of circular enterorrhaphy, and on account of the many mechanical devices that were brought forward about that time, which were intended to simplify the operation; such as the plates used so extensively by Dr. Senn (originally suggested by Connell), Abbe's rings, Robinson's raw hide and segmented rubber plates, Davis' catgut mats, etc.; and finally, on account of the larger aperture that could be secured, by the lateral suture.

The objections to this operation after resection are:

1. The amount of time and the labor required, as both ends have to be closed with two rows of sutures, each row at least an inch long, necessitating four inches of suturing for the end, no matter what method may subsequently be used for the lateral apposition. Then the approximation plates or button is inserted. If the suture be used, it is advised (Abbe) that an opening four inches long be made, and around this be placed one row of Czerny and two rows of Lambert sutures; these rows will

average about ten inches each, which, with the four inches of suturing required to close the ends, make thirty-four inches of suturing. For each inch four to six stitches are required, making a total of 136–204 stitches. An expert operator is able to do this operation in a comparatively short time, as Abbe has done, but how long would it take the average operator?

2. The danger of necrosis of the inverted portion at some point over this long space; this I consider of small moment

3. The danger that one of the many stitches might penetrate the thin mucosa, as they must all include the tunica propria upon which it rests, and be exposed in the calibre of the bowel, producing stitch abscess (as in W. Rindfleisch's cases). The silk remains for an indefinite time.

4. The broad cicatricial mass and the one-half inch of surface-approximation produced by these three rows of sutures, might be expected to contract, as there is no juxtaposition of the incised edges of the various coats of the intestine. This is shown in the case of Salzwedel, lateral approximation of intestine with suture, and still it is the only case we found of post operative stenosis of the intestines, showing that it is of very rare occurrence.

End to Side Approximation.—There are two places in the intestinal tract where this operation should always be given the preference: 1. In resection for cicatricial occlusion of the pylorus, the end of the duodenum should be joined to the side of the stomach. 2. Resection of the cæcum in adults on account of the inequality of size of colon and ileum. In the first case the food is allowed to enter the intestine in about its normal position, and duodenal digestion progresses about the same as if no operation had been performed; of still greater importance is the fact that by this method the bile and pancreatic secretions are not permitted to enter the stomach and cause such grave disturbances as are reported to have occurred (Dr. Heinrich Braun). He considered the condition so grave that he suggested an operation involving a triple anastomosis to prevent the bile from entering the stomach. Lauenstein recommended this operation. End-to-side approximation has no other legitimate place in surgery of the small intestine after resection.

End-to-End Approximation.—We note from the reports of cases in the last six years, 134 intestinal approximations by all methods, of which 49 were end-to-end, 61 side-to-side, and 24 in which the position of approximation was not stated. Of these, 44 cases were for intestinal approximation for acute obstruction, with 29 recoveries and 15 deaths; mortality, 34.1 per cent. For chronic obstruction 43 cases, with 31 recoveries and 12 deaths; mortality, 27.9 per cent.; making a total for obstruction of 87 cases, with 60 recoveries and 27 deaths; mortality 31 per cent. The methods employed in acute obstruction were suture 28, recoveries 18, deaths 10, mortality, 35.6 per cent. Mechanical means 13, recoveries, 10; deaths, 3; mortality, 23.1 per cent. Suture with mechanical aid, 3 cases, with 1 recovery and 2 deaths; mortality, 66.7 per cent. Methods employed in chronic obstruction were, suture, 28 cases; 19 recoveries, 9 deaths; mortality, 32.1 per cent. Mechanical means, 13 cases; 11 recoveries, 2 deaths; mortality, 15.4 per cent. Murphy button, 23 cases, 22 recoveries.¹ Suture with mechanical aid, 2 cases; 1 recovery, 1 death; mortality, 50 per cent. Total number of intestinal approximations for closure of artificial anus, 35; 28 recoveries, 6 deaths; 1 unknown; mortality, 17.1 per cent. Of these 24 were suture, with 18 recoveries, 5 deaths, 1 unknown; mortality, 20.8 per cent.; 7 were by mechanical means, 7 recoveries; 4 were by suture with mechanical aid, 3 recoveries, 1 death; mortality, 25 per cent.

End to-end approximation of the bowel is the most desirable position, as it most closely approaches the natural condition. Surgeons have always regarded the end-to-end as the ideal approximation. This was only deviated from with the hope of reducing the great mortality

¹ Cases were added since table of percentages was made.

that resulted with the methods heretofore employed. Has this deviation accomplished the desired result? Our statistics answer, no. In forty-nine cases of end-to-end approximation by all methods, the above statistics show a mortality of 16.3 per cent.; while in 66 lateral approximations by all methods the mortality was 31.8 per cent. Results of the lateral approximation, therefore, show a mortality about one hundred per cent. higher than that of end-to-end approximation.

Paul remarks that "end-to-end is preferable to lateral union, if it can be obtained with equal safety." The objections raised to the circular suture are: first, the time consumed; second, the possibility of perforation in parts not covered with peritoneum (mesenteric attachment); third, the large number of sutures, and the liability that some of them would go through the entire thickness of the bowel and produce peritoneal infection; fourth, with the invagination method there is the additional danger of a post-operative progression of the invagination, finally producing obstruction; fifth, the danger of obstruction from contraction of the necessarily broad cicatrix.

While these objections have force against the end-to-end approximation by suture, not one of them is valid against the use of the button.

Abbe favors the lateral approximation by suture in the following words: "Lateral anastomosis properly done is eminently the safest and the best method of restoring the canal in most cases." The statistics of lateral anastomosis do not sustain this statement. Our statistics show a mortality in lateral approximation of 34.4 per cent.; end-to-end approximation, 16.3 per cent.; of this the mortality with suture was 20.6 per cent.

The first objection raised to the button was that it is a foreign body in the intestinal tract and might cause obstruction. This accident has not occurred in one of the 65 cases operated upon, nor has it taken place in over three hundred experiments, nor will it occur except where there is a pathological contraction of bowel. The second objection that the necrosis of the tissue within the clasp of the button would be a source of danger, is purely mythical, as the bowel is securely sealed *par excellence* by this method. Infection has not occurred in a single case. The third objection that the small surface of apposition would not prove adequate in the protection of the peritoneal cavity, has as little basis as there is for believing that the wall of the intestine itself is not strong enough to protect the peritoneum, as the pathologists show, in slides herewith submitted, that the intestine at the seat of approximation can scarcely be differentiated from the normal intestine. I have received no information, nor do I know of a case in which there was a failure of union by the button, nor do I believe that such failure will occur except where there is a septic peritonitis *due to infection from without*. The contraction of three-eighths of an inch in the opening, reported by Keen in his case, is in unison with the contraction of the bowel from its previously distended condition, and should be expected under these circumstances. But there is no proof that the contraction would have continued to complete closure, as occurred with the bone plates.

Two years have elapsed since the first operation with the button, in many others over a year, and in a still greater number a shorter period of time. I have received recent reports on many cases, and stenosis has not occurred in a single case.

I here append a synopsis of the cases of intestinal approximation as furnished me by the operators:

CASE I.—From Dr. H. O. Walker, of Detroit, Mich. Diagnosis: Fecal fistula following laparotomy. Several unsuccessful attempts by other surgeons had been made to close fistula; laparotomy, December 8, 1892; excision of about four inches of portion of bowel involved in fistula; end-to-end approximation by Murphy button; time consumed in performing operation, seven minutes; patient made an uneventful convalescence, and in a letter received from Dr. Walker this month, he states that she has been in excellent health since operation, about one

year ago. This was the first case of end-to-end approximation performed on human subject by Murphy button.

CASE II.—From Dr. Hoelscher. Mrs. L., aged thirty-two. Diagnosis: Annular stricture of rectum, situated three inches above the sphincter, which would scarcely admit the tip of finger.

Operation by Dr. Murphy, January 14, 1893.—The sphincter split down to the bone, half of the Murphy button passed up above the stricture. Incision united with sutures. Other half of button placed below the stricture and button pressed together. This produced a necrosis of the cicatricial tissue constituting the stricture, and an end-to-end union of the rectum. The special button used was one and a half inch in diameter, and was voided on the twelfth day. Patient was seen three months after operation, and there was but very little contraction.

CASE III.—From Dr. W. W. Keen, of Philadelphia. Mrs. P.—. Diagnosis: Carcinoma hepatic flexure of colon.

Operation, January 30, 1893.—For repair of artificial anus and reestablishment of continuity of bowel. Enterectomy of portion of bowel involved in fistula; suture of distal end of ileum with Cushing's right angle suture; united proximal end of ileum to side of colon with Murphy button (middle size); closed abdomen; recovery. In writing of this method, Keen says: "The speed and certainty with which an anastomosis can be made, once that the bowel is prepared for it, are certainly advantages which the button possesses over every other means of anastomosis, whether by simple suturing or by bone plates, catgut or other rings. The question of speed in such abdominal operations is of the utmost importance, and this device is by far the quickest of all means of anastomosis." For an excellent review of the method and detailed report of this case, see *Annals of Surgery*, June, 1893. This was the first case of end-to-side approximation with Murphy button.

CASE IV.—From Dr. G. D. Thomas, of Chicora, Pa. Mrs. H.—. aged fifty. Diagnosis: Fecal fistula with stricture of bowel.

Operation, March 25, 1893, by Dr. R. S. Sutton, of Pittsburg.—Lateral approximation was made with Murphy button (largest size); bowels moved twenty-four hours after operation; on and after the sixth day bowels moved regularly, the constipation from which the patient had suffered having been overcome; fecal fistula closed in three weeks without operation.

August 11, 1893.—Patient continued in excellent health, being robust and going about her household duties. This was the first case of lateral approximation by Murphy button.

CASE V.—From Dr. E. Wyllys Andrews, Chicago. Mrs. F. F.—. aged thirty-eight. Diagnosis: Strangulated right femoral hernia.

April 3d.—Herniotomy; gangrene of eighteen inches of ileum; excision, end-to-end approximation with Murphy button (middle size); mass dropped into the abdomen; procedure rapid and easy; no drainage; bowels moved fifth day; nineteenth day, button voided in normal stool; patient discharged April 23, 1893. November, 1893, patient in perfect health.

CASE VI.—Dr. Murphy. Mrs. E. T. S.—. aged fifty-three, in consultation with Dr. Fortier. Diagnosis: Dermoid cyst, intestinal obstruction. Patient removed to Post-Graduate Hospital; laparotomy by Dr. Murphy, June 2d, three days after onset of symptoms. Intestines found adherent in two places to dermoid; but this did not produce the obstruction; cyst removed; obstruction located, a circular band completely occluding small intestine; two inches of intestine excised; approximation made with Murphy button, mass dropped into abdomen. Time for making resection and approximation, five and a half minutes; time for whole operation, including complete closure of abdomen, nineteen minutes. Patient made uneventful recovery; temperature never

reached 100° F.; bowels moved every day after operation; button voided on nineteenth day.

December 2, 1893, patient in excellent health.

CASE VII.—Dr. Murphy. Mrs. K—, aged forty-eight, admitted to Post-Graduate Hospital July 10th. Diagnosis: Strangulated umbilical hernia, peritonitis; laparotomy same day; resection of four inches of gangrenous bowel which had perforated within the sac, and contents had escaped into peritoneum; approximation with Murphy button. Time for resection and approximation, seven minutes; extensive peritonitis; gauze drain; death thirty six hours after operation. Autopsy, one hour later, showed perfect agglutination of bowel, so that the exact line of union could not be defined; specimens exhibited to the post graduate class.

CASE VIII.—From Dr. Hugh McCall, Lapeer, Mich. T. H. P—, aged fifty-five. Diagnosis: Fistula from gangrenous hernia.

Operation, July, 1893.—Lateral approximation with Murphy button (largest size). On seventh day patient had a copious natural bowel movement, the first in seven weeks; the button was perfectly satisfactory in establishing the anastomosis.

CASE IX.—From Dr. Bacon. Mrs. L—, aged thirty-five. Diagnosis: Specific stricture of rectum, beginning two inches above sphincter and extending up two inches.

Operation, July, 1893: Modified Kraske, exposure of rectal wall, which was denuded, folded upon itself; button passed on sixteenth day. There was some hemorrhage a week or ten days after the button passed. The result is very gratifying; the patient was examined May 20, 1894; found rectum of ample calibre, and the wall, which was previously dense, is now soft and pliable.

CASE X.—Dr. Murphy, on September 10, 1893, at the request of Dr. Joseph Price, of Philadelphia, in the latter's private hospital, performed a lateral approximation for fecal fistula on Mrs. K—, in the presence of the members of the Pan-American Medical Association. Cause of fistula, strangulated femoral hernia; Murphy button (largest size) used in making approximation. Time from beginning of operation until completion of anastomosis six minutes.

Under date of October 24th, Dr. Price writes: "Your patient made a beautiful recovery and has gone home healthy and happy; her bowels act kindly, and the fistula closed without operation; passed button on twelfth day.

CASE XI.—Dr. Murphy. Mrs. B—, aged forty-five. Diagnosis: Fecal fistula following laparotomy for tumor. Present at operation, Drs. Mayo and McGahey and members of the Pan-American Medical Association.

Operation, September 26th.—Lateral approximation. Time, seven minutes; recovery. Fistula not yet closed.

CASE XII.—From Dr. W. B. Rogers, Memphis, Tenn. Male. Diagnosis: Strangulated inguinal hernia.

Operation, October 11, 1893.—Herniotomy, removal of ten inches of gangrenous intestine, end-to-end union with Murphy button (largest size). Button voided on seventh day. Patient up and about in four weeks.

CASE XIII.—From Dr. H. O. Marcy, Boston, Mass. Male. Diagnosis: Cancer of upper portion of rectum; profuse and dangerous hemorrhage. Case had had a previous left inguinal colostomy.

Operation, October 16, 1893.—Removal of coccyx and two-fifths of sacrum; opened the peritoneum; divided meso-rectum, which permitted the bowel to come well down, resected four inches of rectum, and joined it end-to-end with Murphy button (largest size); button removed with slight traction on twelfth day. Patient made uneventful recovery. Dr. Maurice Richardson congratulated Dr. Marcy on the result obtained in this case, and in commenting on it, said: "It would seem to indicate that by this means cases were amenable to treatment that were heretofore inoperable."

CASE XIV.—From Dr. C. E. Ruth, Keokuk, Ia. A. W., aged five and a half. Diagnosis: Tumor of

cæcum, obstruction of three months' duration; patient very much emaciated.

Operation, October 18, 1893.—The entire cæcum, with two inches of colon and three-quarters of an inch of ileum excised, together with the enlarged glands in the neighborhood; approximation of end of ileum to end of colon with Murphy button (smallest size).

Dr. Ruth¹ remarks: "This is the first excision of the cæcum, to my knowledge, in one so young, for intestinal obstruction due to neoplasm, and the first in which the Murphy button has been used to make the end-to-end junction of ileum to colon, in the human subject. Pulse at end of operation, which lasted but a few minutes, 160. Patient made an uneventful recovery, and on November 4th left for his home, apparently in the best of health. In spite of the objections made to the Murphy button, these stubborn facts remain: 1, It furnishes the strongest junction known; 2, we do not need to wait five days to get strong union, it is immediately obtained with proper approximation of the segments; 3, in urgent cases nourishment can be commenced at once, which would be scarcely thought of in connection with any suture or plate device; 4, no foreign body is left permanently in the walls of the gut or in the peritoneal cavity to cause subsequent trouble; 5, in anastomosis between the gall-bladder and duodenum; in the formation of biliary, gastric, or fecal fistulæ externally, and by Bacon's method of treating non-malignant strictures of the rectum, it leaves nothing to be desired; 6, if 'circular enterorrhaphy,' undoubtedly the ideal approximation, is ever justifiable, it is by this means, as it minimizes the objections urged against the operation, viz, weakness at the mesenteric attachment and subsequent contraction; 7, the union can be made in less time than by any other means, thereby greatly lessening the primary mortality. The objection has been urged that the opening through the button is not sufficiently large. In my case the smallest-sized button was used, and the immediate symptoms of obstruction were decidedly less than at any time during the three months previous to the operation, and the pain was also less, showing that there is no need to fear on that score. In the small intestines the contents, being fluid, will pass, and of course there will be no difficulty with the gas as far as the button is concerned. In the management of these cases it is presupposed that the surgeon would use ordinary intelligence in feeding after a resection of the intestine, and not diet his patients on food that could not be rendered fluid, or nearly so, in the small intestines. All the alimentary functions seemed perfect after the eighth day. On the fifteenth day he is dressed and walking about, apparently perfectly well. He is rapidly gaining in flesh and strength. Microscopical examination showed the tumor to be a large rounded sarcoma."

Dr. Ruth's conclusions are based upon very extensive experimental research.

CASE XV.—From Dr. A. I. Bouffleur, Chicago. Female. Diagnosis: Intestinal obstruction from strangulated femoral hernia, in which a herniotomy with enterotomy in gangrenous portion had been made two days previous without relieving the obstruction, making six days in all from beginning of strangulation.

Operation, November 11, 1893.—Laparotomy, excision of four inches of bowel at seat of gangrene and fistula, end-to-end approximation with Murphy button (largest size). Time for resection and approximation, four and a-half minutes, the quickest time in which this operation had been performed, notwithstanding the fact that the doctor had not used the button previously. Abdomen closed without drainage. Patient was very much collapsed at time of operation; however she gradually improved and made an uneventful recovery, having copious passages two days after operation.

CASE XVI.—From Dr. A. H. Cordier, Kansas City, who writes as follows: "On November 16, 1893, I operated for intestinal strangulation (acute), due to a complete

¹ Tri-State Medical Journal, December, 1893.

stricture of the ileum, from an old inflammatory band. The constriction had existed ten days previous to operation. I used the button, and am pleased to tell you that his recovery up to this date, November 27th, has been an ideal one. His bowels moved within three hours after the operation. This was my first experience with the button, but I have used rings, mats, decalcified bone plates, etc., and I must say that the button is the quickest, easiest, safest, and surest of anything I have so far tried."

CASE XVII.—From Dr. Carl Beck, Chicago, September, 1893. Patient aged thirty five. Diagnosis: Cancer of pylorus, involving liver, pancreas, and mesentery. Maydl's operation, duodeno-jejunosomy, using Murphy button for anastomosis. Patient progressed nicely until the evening of the seventh day, when symptoms of peritonitis began and terminated in collapse the following day. Autopsy revealed a peritonitis; another cancer in the sigmoid flexure obstructing the same. The food that had been injected per rectum had ruptured the bowel at this point and caused the fatal peritonitis. The button, which was of excellent use in the operation, was found in place; perfect union over the entire circumference; no omental adhesions around the point of union, nor in the neighborhood. I think if it were not for the complication of the second carcinoma, the case would have been a perfect success. As to the usefulness of the button, it has been a most beautiful illustration.

CASE XVIII.—*Cæcectomy. End-to-end Approximation of Ileum to Colon, with Murphy Button.* By Dr. Alexander Hugh Ferguson.—"Mrs. X—, suffering with a cancer of the cæcum for many months, emaciated, cachectic, presented herself for relief of intestinal obstruction.

"Operation, December 11, 1893.—I decided upon the removal of the cæcum, lateral incision, adhesions severed, ligation of mesentery, excision of one inch of ileum, cæcum, and two inches of ascending colon, end-to-end approximation of ileum to colon with Murphy button. Button liberated on sixteenth day. Recovered."

CASE XIX.—*Lateral Approximation of Small Intestine with Murphy Button.*—Mrs. McC—, aged fifty-seven. Several months previous suffered from strangulated umbilical hernia with necrosis of loop of intestine; enterostomy was performed, both ends of the bowel retained in the wound; since that time patient has had a continuous discharge of the entire contents of the small intestine on the surface of the abdomen.

Operation, December 12, 1893, by Drs. Charles McBurney and J. B. Murphy, in Sim's operating theatre.—Ends of intestine plugged with gauze as a guide to the loops to be approximated. Incision in median line below the openings; loops readily secured; largest button placed in position; time of operation, five and a half minutes. Button escaped nine days after operation through fistula. Recovered, fistula still open.

CASE XX.—*Fecal Fistula at Ileo-cæcal Region. Enterectomy End of Ileum Joined to Side of Colon with Murphy Button.*

Operation, January 15, 1894, by Dr. Alexander Hugh Ferguson, of Winnipeg, Manitoba.—Mrs. X— suffered from a fecal fistula following an operation on the intestine. The ileum was severed from its attachment to the colon, a portion of the latter in which the fistula was situated was resected, end of colon sutured, end of small intestine joined to the side of colon with Murphy button. The result was perfect and the button passed on the sixteenth day. Patient did not have an unpleasant symptom after the operation.

CASE XXI.—*Resection of Six Inches of Sigmoid Flexure of Colon, with End-to-end Union with Murphy Button.*—Dr. Joseph Price, of Philadelphia, under date of February 13, 1894, writes as follows: "I did an unique piece of surgery on the 3d. I found an universally adherent cyst, malignant invasion of sigmoid—the bowel too strongly imbedded in cyst-wall for enucleation. I severed the bowel above and below the adhesions, leaving

six inches of bowel on cyst-wall taking out a V-shaped piece of the meso-sigmoid. I placed in both extremities a puckering string, inserted a Murphy button, pressed it home; the work was quickly and beautifully done. By any other method it would have been a tedious piece of work. The result has been perfect. The button passed on the ninth day. Since July last I have had a run of over one hundred and forty sections without a death from any cause. The Murphy button saved one that would have been hopeless without it, so you see your button is helping to give me a nil mortality.

CASE XXII.—By Dr. Carl Beck, of Chicago. Diagnosis, fecal fistula. Operation, duodenojejunosomy. Fistula had existed for some time. The approximation was made two inches from the fistulous opening with Murphy button (small size); no inconvenience; convalescence uneventful; button discharged on twentieth day.

CASE XXIII.—By Dr. Willy Meyer, New York. Mrs. L. P—, aged forty-three years. Diagnosis, carcinoma of pylorus. Operation February 24, 1894: resection of five inches of greater and three inches of lesser curvature of stomach; continuous Czerny-Lembert suture of end of stomach; complete closure; resection of one inch of duodenum with pylorus; end approximation of duodenum to latero-posterior wall of stomach with Murphy button (largest size). Time for inserting button and making approximation less than eight minutes. Uninterrupted recovery. Button voided on twenty first day.

CASE XXIV.—By Dr. Willy Meyer. Male, aged forty-six. Diagnosis, sarcoma of abdominal wall involving small intestine.

Operation, March 3, 1894: extirpation of a large fibro sarcoma of abdominal wall with resection of fifteen inches of ileum which was infiltrated and twisted upon itself; end-to-end approximation by Murphy button; uneventful recovery.

CASE XXV.—By Dr. W. T. Dodge, Big Rapids, Mich. Boy. Diagnosis: fecal fistulæ, following gun-shot wound; two unsuccessful attempts to close the openings with suture had been made; the opening on the left side connected with the small intestine and the one on the right with the large intestine. The patient was rapidly emaciating on account of loss of nutriment.

Operation, January 2, 1894: incision on side of opening in small intestine; intestinal adhesions liberated and the intestines drawn out of the wound; resection of three inches at seat of fistula; end-to-end approximation with Murphy button; on eighth day the button escaped through the fistula in the large intestine. Recovery.

CASE XXVI.—By Dr. W. T. Dodge. Same patient as above. Operation, February 16, 1894: incision on side of fistula in large intestine; adhesions liberated; large intestine drawn out, resection of three inches; end-to-end approximation with special large-sized button. ("This button was ordered by Dr. Murphy for this case. its diameter was one and a half inch; diameter of central opening seven-eighths of an inch.") Having made the approximation I searched for the seat of the previous approximation. I found that it was not adherent to the abdominal wall and could only be recognized by the slight omental adhesions. It was of the same calibre as the rest of the bowel. The abdomen was completely closed. On the morning of the eighth day the button appeared at the sphincter and I assisted its escape. Perfect recovery."

CASE XXVII.—By Dr. W. T. Dodge. Female. Diagnosis, double ovarian cyst. "Operation, May 8, 1894. Cyst adherent throughout; it was found necessary to resect a portion of the small intestine. An end-to-end approximation was made with Murphy button; patient was very much shocked, but rallied from the operation; drainage-tube was kept in position; on the third day a fecal odor was noticed from the discharge; there was considerable nausea and vomiting; some fecal matter escaped through the wound on the fifth day; as the feces were liquid I concluded the escape was from the small intestine. As the patient had considerable pain on the tenth

day I opened the wound; soon found the small intestine at the seat of anastomosis, the union was perfect and the button gone; the opening from which the faeces escaped was found at the junction of the sigmoid and rectum. I made a colotomy. The patient died of shock the same night. While this case terminated unfavorably it has strengthened my faith in the Murphy button. The button was found in the rectum."

CASE XXVIII.—By Mr. A. Lane, Guy's Hospital, London. Diagnosis, sarcoma of mesentery of sigmoid. Operation, resection of tumor with twelve inches of large intestine; end-to-end approximation with Murphy button (largest size); gauze drain; button voided eighth day. Recovery. For details of this case see *Lancet*, April 21, 1894.

CASE XXIX.—By Dr. Joseph D. Bryant. Female. Diagnosis, fecal fistula of long standing. There had been several operations previous for its closure. The fistula was believed to connect with the transverse colon. Operation, May 9, 1894: lateral approximation of ileum to descending colon with oblong button (two and one-half inches in length); the button was easily inserted. Convalescence uneventful. Button passed on fifteenth day. Dr. Bryant was the first to use the oblong button on the human being, and I am much pleased to notice that it passed at such an early day, as the long button has a larger area of pressure atrophy than the circular one. Dr. Bryant will publish a detailed report of this case later.

CASE XXX.—By Dr. George Shrady. Female. Diagnosis, fecal fistula following gangrenous hernia. Operation, May 14, 1894: laparotomy in right inguinal region; lateral approximation with large-sized Murphy button; abdomen closed; perfect convalescence. May 26, 1894, operation for closure of fistula.

CASE XXXI.—By Charles McBurney. Diagnosis, tumor of cæcum. Operation, February 12, 1894, ileo colostomy with Murphy button; infection occurred and a fecal fistula formed, on account of absence of adhesions; the button was removed through the fistula; a small fistula now remains. This report was furnished me by Dr. Gibney.

CASE XXXII.—By Dr. Robert Abbe, New York. Diagnosis, complete obstruction of colon by malignant growth. Operation, April 27, 1894, lateral approximation of ileum to colon with Murphy button, for relief of symptoms of obstruction, preparatory to extirpation of the growth. Convalescence was perfect.

CASE XXXIII.—Dr. T. A. Davis, Chicago. Diagnosis, strangulated left inguinal hernia. Operation, April 1, 1894, one hour after patient was seen; herniotomy; bowel found gangrenous, incised, and allowed to remain protruding from the inguinal canal; an incision was made three inches to the right; the abdomen opened and a lateral approximation made with largest size Murphy button; bowels moved within twenty four hours; perfect convalescence; gangrenous portion of bowels sloughed off and the fistula has already closed.

CASE XXXIV.—By Dr. McLaren, of St. Paul. Diagnosis, adherent ovarian cyst. Operation, February 28, 1894; six inches of sigmoid resected with cyst; end-to-end approximation with Murphy button. "I do not think that this operation could have been accomplished by any other means. Patient made a beautiful recovery."

Conclusions.—1. The more rapidly the operation is performed, the less the danger from shock.

2. The less the manipulation and exposure of the intestine, the less the danger of infection, post-operative paralysis, and adhesions.

3. The more uniform and continuous the pressure at approximation, the greater the assurance of adhesion and the less the liability of infiltration.

4. A line of approximation is as good as half an inch.

5. Mechanical means in the last six years have produced better results than the suture, in both lateral and end-to-end approximations.

6. The mortality in end to-end approximations is much

less than in lateral apposition, and should always be given the preference.

7. The more perfect the juxtaposition of the various layers, the less the interposition of fibrous tissue, and the more complete the regeneration across the line of union.

8. The juxtaposition of the similar histological layers of the wall of the intestine is an assurance against cicatricial contraction.

9. The more extensive the approximation surface, the larger the fibrous deposit, the greater the contraction.

10. The contraction with end-to-end is less than with lateral approximation.

11. *The lateral approximation by means of the button is the only method in which the aperture is produced by the removal of tissue, all other methods depending upon simple incision.*

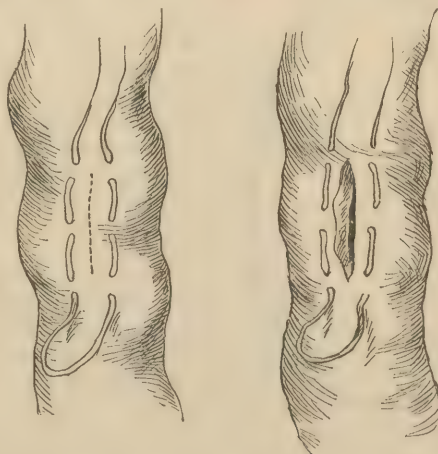
12. The *modus operandi* of the button is based upon the following principles: First, it retains apposition automatically, that is, without suture; second, union of tissue is produced at line of pressure atrophy; third, the pressure atrophy is produced by elastic pressure; fourth, it produces juxtaposition of the edges of same coats; fifth, the union is accomplished by the smallest possible cicatrix, and therefore must yield the least contraction of any operation; sixth, the rapidity of application gives all the advantage that the saving of time can accomplish.

I desire to express to Dr. F. S. Hartmann my appreciation for valuable assistance rendered in the preparation of this paper.

APPENDIX.

I have received so many letters within the last few months regarding the technique of the insertion of the button, that I deem it necessary to append it in detail.

Technique of Insertion.—1. *Cholecystoenterostomy.*—An incision is made from the edge of the ribs, two inches to the right of and parallel to the median line, extending downward three inches. The gall-bladder and duodenum are drawn into the wound; a needle with fifteen inches of silk is inserted in the duodenum directly opposite the mesentery and at a point near the head of the pancreas; a stitch is taken through the entire wall of the bowel one-third the length of the incision to be made; the needle is again inserted one-third the length of the incision from its outlet, in a line

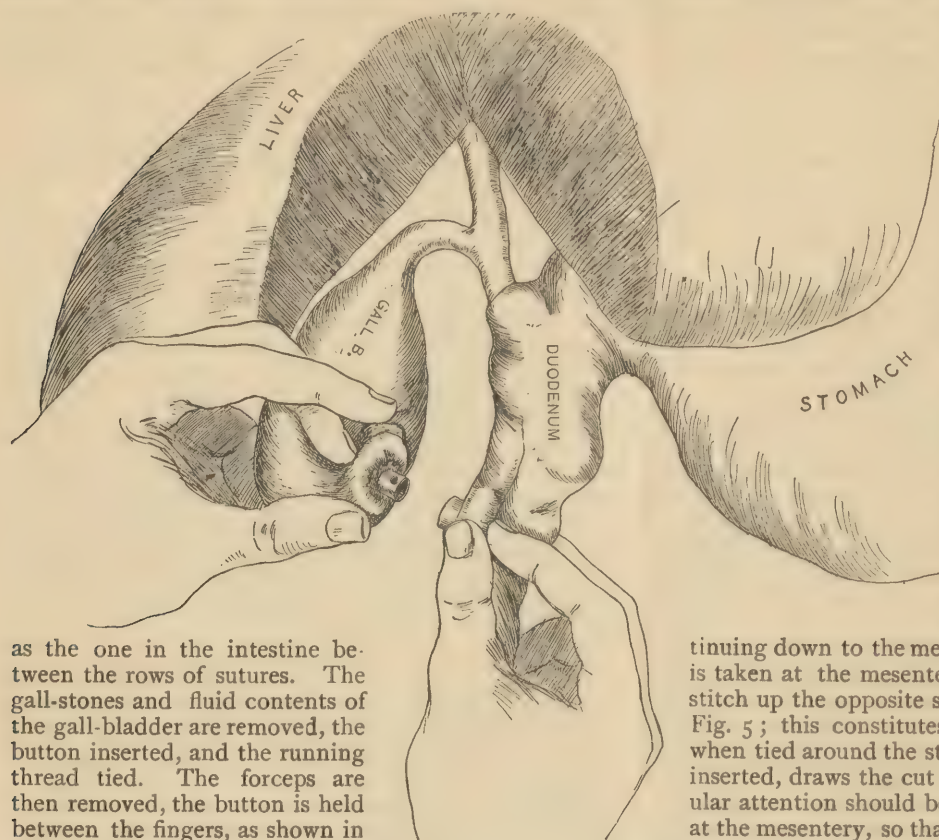


FIGS. 2 and 3.—Showing Running Thread Before and After Incision in Bowel.

with the first and embracing the same amount of tissue as the first. A loop three inches long is held here and the needle is inserted in a similar manner, making two stitches parallel to the first in the reverse direction and one-fourth of an inch from it, coming out at a point near the original insertion of the needle (Fig. 2). This forms the running thread, which when tightened draws the incised edge of the bowel within the cup of the button.

A similar running thread is inserted in the gall-bladder; an incision is now made in the intestine two thirds the length of the diameter of the button to be used; avoid cutting the running thread when making the incision.

The button is slipped in, the running thread tied firmly around the central cylinder; an assistant holds the button in position with the hæmostatic forceps. An incision is now made in the gall-bladder the same length



as the one in the intestine between the rows of sutures. The gall-stones and fluid contents of the gall-bladder are removed, the button inserted, and the running thread tied. The forceps are then removed, the button is held between the fingers, as shown in Fig. 4, and slowly pressed together. Note that the edge of the incision comes entirely with-

FIG. 4.—Button as Held when Pressed Together, Performing Cholecystoenterostomy.

in the clasp of the button before it is completely closed. A sufficient degree of pressure must be used to bring the serous surfaces of the gall-bladder and intestines firmly in contact and compress the tissues. The elastic pressure of the spring cup of the button produces a pressure atrophy of the tissues embraced by it and leaves an opening as large as the button. When the button is liberated it passes on through the bowel.

2. *Pylorotomy*.—Having drawn the pylorus into the abdominal wound ligate the greater and lesser omenta and cut them off; then make a circular incision on a groove director with the scissors, cutting through the muscular and serous coats down to the mucous coat, completely around the stomach where it is to be excised; then denude the mucous membrane of its muscular and serous coats for half an inch in the direction of the fundus; excise the mucous membrane at this point; close the mucous membrane

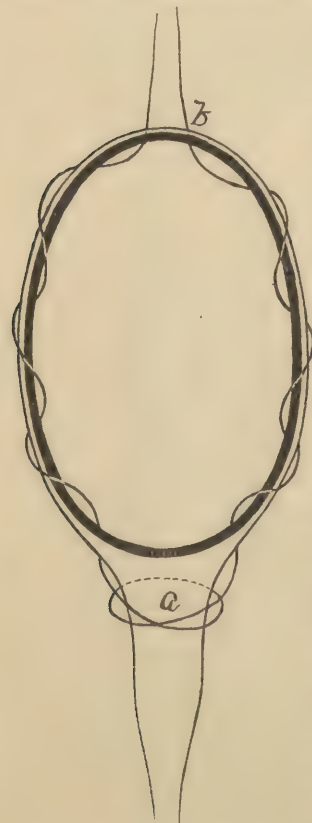


FIG. 5.—Manner of Inserting Running Thread in End of Bowel.

with continuous catgut suture, and over this the serous and muscular coats with interrupted silk suture. The

end of the stomach is now completely closed. Excise the duodenum an inch and a half below the pylorus, insert a running thread as described under the head of end-to-end approximation, to follow; place the male half of the button in position. The female half of the button is inserted in the posterior wall of the stomach two inches from the line of suture, in the same manner as it is inserted in the gall-bladder. The forceps are removed and the button pressed together. The end of the duodenum is thus joined to the posterior wall of the stomach. The button liberates itself and passes on through the bowel.

3. *End-to-end Approximation*.—The intestine is cleared of its contents and the intestinal compression clamps placed in position; the mesentery of portion to be excised ligated; portion of intestine excised; running thread placed in position by a top stitch along the incised edge, beginning opposite the mesentery and continuing down to the mesentery; one return over-stitch is taken at the mesentery and then continue the top stitch up the opposite side to the starting-point, as in Fig. 5; this constitutes the "puckering-string," and when tied around the stem of the button, which is then inserted, draws the cut edge within its clasp. Particular attention should be given to the return over-stitch at the mesentery, so that both layers of the peritoneum overlap. The other half of the button is inserted in the same manner and is then pressed together. Close opening in mesentery with one or two sutures.

4. *End-to-side Approximation*.—Half of the button is inserted in the same manner as for end to end approximation and the other half the same as for lateral approximation and is pressed together.

When inserting the half of the button to which the circular compression ring is attached, compress the ring to the edge of the bowl and grasp both with the forceps. This holds the ring down to a level with the bowl, and is then more easily inserted; then change the grasp of the forceps to the edge of the cylinder and tie the running thread.

Do not make the incision too long, not more than two thirds the diameter of the button; it will stretch. Hold the wall of the intestine at each end of the wound with tissue forceps while inserting the button. Do not cut the running thread when making the incision.

Do not inclose too much tissue in the suture. When closing the button be sure that the incised edge is always within the clasp of the button. Bear in mind that the button is not indestructible. Do not use a Lembert suture with the button; it is useless. It is not necessary to abrade the peritoneum.

Button.—I have seen a number of imperfect buttons on the market, therefore they should be carefully examined before purchased. The spring should always be made of brass, steel will rust. The edge of the cup should never be sharp, but should have a line of surface.

[Since this paper, including history of Mrs. B——, Case XII., went to press, I had occasion to operate for the closure of fistula. Two continuous loops of ileum were adherent at seat of fistula. A continuation of the distal loop was found adherent to the vaginal wall; all of the adherent coils were excised and an end to-end approximation made. Examination of the seat of the lateral anastomosis, which was performed nine months ago, revealed a linear scar as soft and pliable as any portion of the intestine, no adhesions of omentum. The circumference of

the opening measured five inches, while the circumference of the button used was only three and one-half inches. Twenty-four inches of intestine excised. Patient in excellent condition at present, fifth day after operation.]

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